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The Outlook

Worth the Money

MANY different views have been expressed concerning the Bristol Brabazon. Some have held that it is a white elephant which can never be made to pay for itself. Others have professed to see in it the sole champion of British prestige in the air. The sane view is, of course, that it is neither. The statement by the Minister of Supply at Filton the other day that the total cost of the first machine will be just under £12 million hit the headlines with a bang, but in fairness to the daily press it must be admitted that it gave as much prominence to Mr. Strauss's pronouncement that he considered the cost fully justified. This is the first time a Government spokesman of such high standing has made a definite statement on the subject, and as such it is to be welcomed.

There is no reason to believe that the Brabazon will have any serious vices. After all, its general layout is orthodox, and thus any uncertainty there might be would arise from its size. It is precisely this factor which has caused the first machine to cost so much. It must be remembered, and taken into account, that nearly one-half of the superficially staggering cost is accounted for by land, runway, hangars, and the vast amount of research and testing made necessary by the size of the aircraft.

If, subsequently, several versions were to be built, that part of the cost would be spread over them. Even so, the sums involved would be such that no operating company could possibly assume the burden, nor would it be reasonable to expect it to do so. The Brabazon is an experiment in size, and the knowledge gained during its construction and testing will be of great value for application to other projects. Thus the price of gaining that knowledge can fairly be regarded as a national responsibility.

It has often been said that the Brabazon could not be operated economically. Mr. Peter Masefield appears to have come to a different conclusion. In his British Commonwealth and Empire Lecture to the Royal Aeronautical Society he stressed the importance of the aircraft being designed specifically for the route, and in that part of his lecture which we summarized last week he gave figures which showed that the Brabazon was the most economical type for stage lengths from 2,350 miles up to its maximum of 3,920 miles. Moreover, it is the only type capable of regularly making the direct non-stop flight between London and New York against the average head wind and still make a profit.

Mr. Masefield also showed that the Brabazon should have a lower hourly cruising cost per ton than five of the other six aircraft types with which it was compared. In the matter of take-off and landing cost per landing, the Brabazon achieved the lowest figure of all the types, with £3 19s 4d per ton.

Air Power

THE Air League of the British Empire launched its campaign for funds at a reception held at Londonderry House last week. The gathering was one of the most distinguished which the League has ever got together, and it is to be hoped that all those present will use their influence to raise the sums which are necessary if the League is to achieve its aims. As Air Chief Marshal Sir Philip Joubert said in his appeal, these aims deserve the widest support. They were stated to be: Invincible air power; a strong Air Training Corps; a powerful Empire aircraft industry; efficient civil air services; research and development on an adequate scale; encouragement of private flying; and facilities for aeronautical eduction and training.

No one could find fault with these aims. Their fulfilment is necessary to the future of the British Commonwealth. But as Lord Tedder said at the reception, although almost every one agrees in a vague and general way that air power is essential, the country as a whole

does not appreciate all that the attainment of air power implies. First-class aircraft and engines, Lord Tedder said, our aircraft industry has given us. But much more is necessary, and nothing is more important than getting the right men. The Air League can do for the R.A.F. what in days gone by the Navy League did for the Navy, in the days when that was our first line of defence, a role now assumed by the Royal Air Force.

Given the necessary financial support, we have no doubt that the Air League will do its share in ensuring that an appreciation of the implications of what air power really means is impressed upon the country, and especially upon the young people.

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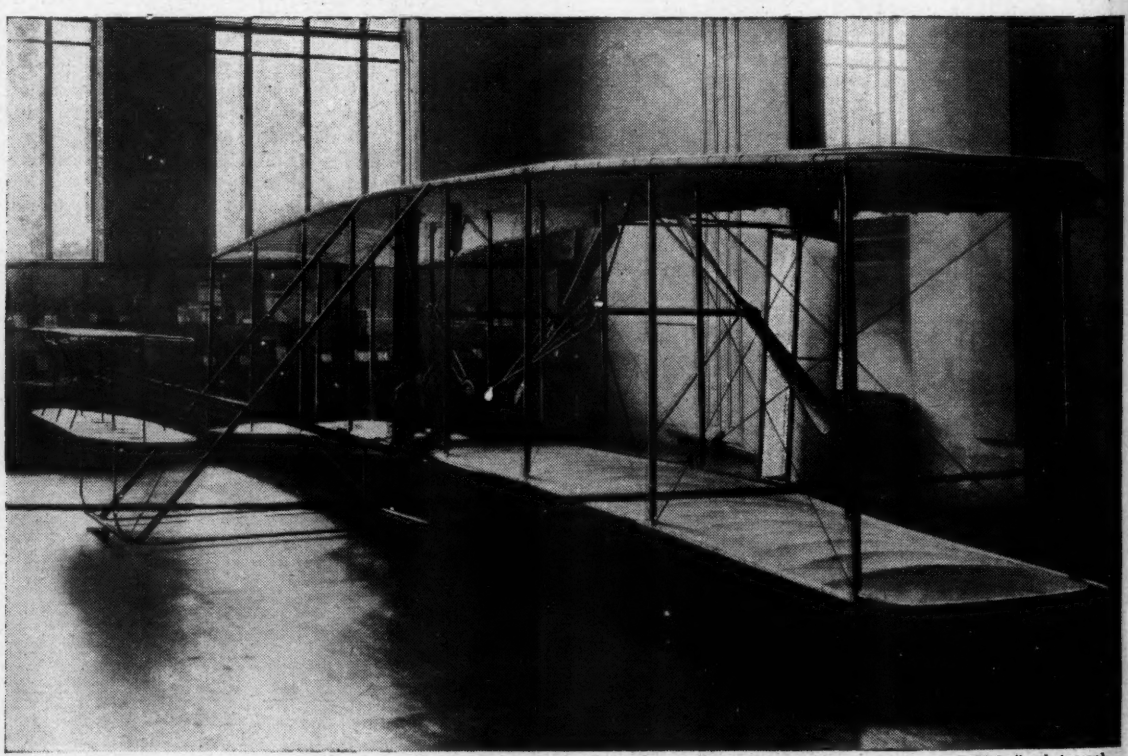
Departure of the Pioneer

ALL who revere the memory of the Wright brothers must feel a touch of sadness at the removal from the Science Museum, South Kensington, of the biplane on which Orville Wright made his historic first free power-driven flight at Kitty Hawk on December 17th, 1903.

The original Wright biplane has occupied the place of honour in the Science Museum for twenty years, but in accordance with the wishes of Orville Wright, expressed shortly before his death, it is now being returned to the Smithsonian Institution in Washington. The ceremony of lowering the Wright machine to the floor was attended by representatives of the Royal Aeronautical Society, the Royal Aero Club, the Air Ministry, the Royal Aircraft Establishment, and other bodies. In addition, many British aviation pioneers had taken the opportunity to pay a last tribute to the memory of the Wright brothers. At the ceremony the Minister of Education referred to the remarkable progress made in flying during less than half a century, and Mr. L. Satterthwaite, American Civil Air Attache, received the machine on behalf of his Government.

The Wright biplane is not only the first heavier-than-air machine to fly. In addition, the circumstances in which it came to this country in 1928 were such as to merit the fullest honours on the occasion of its departure twenty years later. The Langley "Aerodrome" was exhibited in the Smithsonian Institution with a label which conveyed claims that were not in accordance with facts. Mr. Orville Wright very naturally resented this, and as the secretary of the Smithsonian Institution refused to put matters right, Mr. Wright had his machine removed and sent to the Science Museum, South Kensington, where it was to remain for a period of five years, a period which was later extended. It was fitting that British aviation should honour its departure.



"Flight" photograph.

AFTER TWENTY YEARS. The original Wright biplane on which Orville Wright made the first power-driven flight in 1903 is being sent back to Washington. It has been in the Science Museum, South Kensington, since 1928, except for the war years. The prone figure of the pilot hides the Wright engine, which is lying on its side. The propellers are chain driven and contra-rotating.

The Cierva Skeeter made its first free flight less than a month after the S.B.A.C. show at Farnborough, where it was one of the great attractions. Mr. H. A. Marsh is continuing the tests.

CIERVA SKEETER FLIES

First Step Towards Cheaper Helicopters Combines Simplified Components with Orthodox Layout and an Unusual Engine

BASIC principles of rotating-wing flight having been fairly well established, the next step in the evolution of this intriguing mode of locomotion is to reduce the price of helicopters, which at the moment is necessarily high, due to the experimental nature of the machine and the relatively small numbers being built of any given model.

The Cierva Autogiro Co., Ltd., hope with the small two-seater Skeeter shown at Farnborough, to get the price down to below £3,000 if sufficient orders justify production in reasonable quantities. Even this figure may appear high, but it should be remembered that already helicopters costing several times that amount have been found capable of earning their keep by doing certain classes of work far more cheaply than could any other means. It is largely a question of utilization, and in actual operation the Cierva company estimates that the all-in running cost of the Skeeter will be comparable with that of a 20 h.p. motor car.

Reduction in manufacturing costs has not been achieved by departing from what is already becoming normal practice. The main three-bladed rotor shows all the usual features such as flapping and drag hinges, dampers, and collective and cyclic pitch control. It is in the simplification of the individual components of the whole mechanism that the Cierva design team, headed by Mr. C. G. Pullin (who is also managing director), has endeavoured to cheapen quantity production.

"Flight" photograph.

The components of the rotor head of the Skeeter are designed for simplicity in manufacture. The usual flapping and drag hinges are employed, and cyclic and collective pitch controls are orthodox.

The first free flight of the Skeeter shown at Farnborough (G-AJCJ) was made a short time ago by Mr. H. A. Marsh, the firm's test pilot and general manager, at the Airport, Southampton. One of our pictures shows the machine in flight. As the general system is that which Mr. Sikorsky has made classic, there is little reason to expect that the development period will be unduly long.

Figures and Estimates

A few relevant figures will indicate the main characteristics of the W.14 Skeeter. The main rotor has a diameter of 29ft and the overall height is 8ft. With an empty weight of 810 lb and a normal gross weight of 1,210 lb the disposable load is 400 lb. It is estimated that the Skeeter will cruise at about 75 m.p.h., and as the Jameson engine of about 100 h.p. has a very low fuel consumption, the range is quite reasonable. In such a small machine the weight of a passenger is a large item, and this fact is reflected in the still-air ranges (estimated), which are 155 miles with passenger and 270 miles solo.

In its way equally as interesting as the airframe is the Jameson FF 1 flat-four engine which powers the Skeeter. Readers may remember the description of this remarkable engine which we published on May 23rd, 1946. At that time, we devoted considerable space to analysing the design because we evaluated the technical features of the engine as being of extreme importance. We are human enough to take

Cierva Skeeter Flies . . . . .

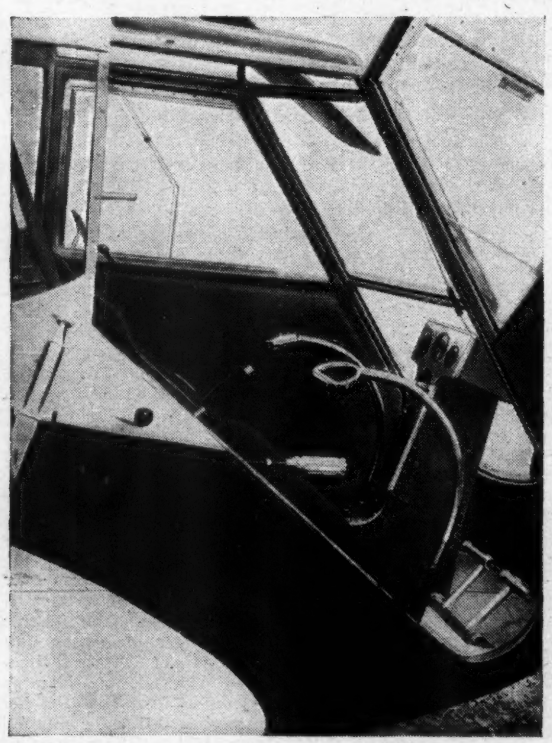
pleasure in having our early faith vindicated as completely as it is by the performance figures set out in the A.R.B. Civil Type Approval Certificate. This is, of course, a quite exhaustive document, and for reasons of space we can abstract only a few of the more interesting items. Nevertheless, these are more than sufficient to establish the extraordinary operational factors of the engine.

Before giving figures it may be useful briefly to recapitulate the salient features of the FF 1. In general terms, apart from the use of a two-pin crankshaft, the layout accords with normal flat-four practice. This, however, excludes the application of Mr. Jameson's heterodox induction theory. In brief, this theory postulates the total suppression of turbulence in order to obtain what can best be described as progressive stratification of mixture strength, from a small lodgment of rich mixture adjacent to the sparking plug, down to almost pure air adjacent to the piston crown.

In practice, this form of induction gives quite unusual running characteristics. The very high proportion of diluent air carries away the radiant heat and thus gives very low running temperatures. At the same time, the extremely weak mixtures (the rich-mixture setting is of the order of 20:1) make possible the amazingly low specific consumption figures. The "long-term" power stroke, bringing about as it does a change in the indicator diagram entropy, permits unusually high b.m.e.p.s to be recorded in conjunction with very smooth running and a cruising rating of 92 per cent full throttle.

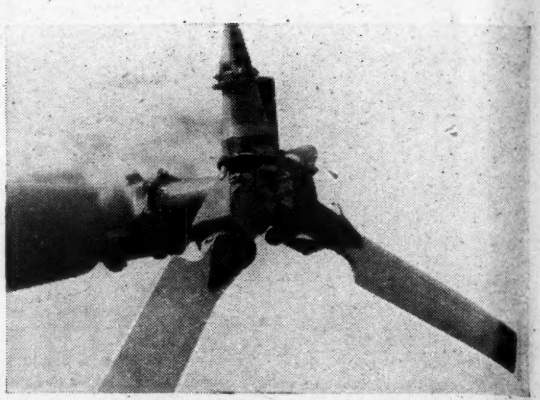
Power Maintenance at Height

These few highlights are sufficient to indicate the unorthodox qualities of the Jameson engine and, in turn, to raise the possibility that, due to the excess air (relative to the requirements of combustion) passed through the engine, it may well be possible that the sea level power ratings will be maintained up to that altitude at which the excess oxygen breathed by the unit will compensate the reduction in ambient density. Further, it has been established that the power/r.p.m. curve of the engine falls remarkably closely to the power/r.p.m. requirements of its airscrew, and the result is that, in most respects, virtually the same performance will be obtained with a fixed-pitch as with a variable-pitch airscrew when used in conjunction with this power unit in a fixed-wing aircraft.



"Flight" photograph.

Dual controls of the Skeeter. Cyclic pitch is controlled by the curved columns, and there are separate levers for the collective pitch control.



"Flight" photograph.

The usual collective pitch control of the three-bladed tail rotor is very light and could not well be much more simple.

For helicopter applications, the important and peculiar qualities of the FF 1 are the smooth running characteristics over the whole power range; the close relation of cruising and full-throttle powers; and, perhaps most important of all, the very low running temperatures. This last quality means that the cooling drag penalty imposed is very small. It is almost impossible to arrange an air-cooling system for a helicopter engine without employing a fan, and, as the power absorbed by a cooling fan is a direct deduction from the shaft power available for take-off, the lower the cooling demands made by the engine the better. It is in this regard that the Jameson engine's requirement of a cooling depression across the cylinder of but 4 to 5in water gauge at full throttle is so very important an advantage. We believe we are right in saying that, in the case of the Skeeter, it is possible to take-off at little over half-throttle, this being in no small measure due to the negligible abstraction of power for cooling.

The Air Registration Board has approved the engine for clearance in civil aircraft classified in the special category sub-divisions F, G, H and I, and in the Board's Civil Type Approval Certificate, the following performance values are approved:

JAMESON FF1 ENGINE

Bore	4.125in
Stroke	3.75in
Compression ratio	7.4 : 1
Swept volume	3.28 litres
Airscrew reduction gear ratio	0.619 : 1
Net dry weight	290 lb. + 2½ per cent

Performance

Max. take-off power	102/106 b.h.p.
Max. take-off r.p.m.	3,050
Specific fuel consumption	0.44/0.47 pints/b.h.p./hr
Max. continuous power	88/92 b.h.p.
Max. continuous r.p.m.	2,800
Specific fuel consumption	0.41/0.43 pints/b.h.p./hr

Ratings

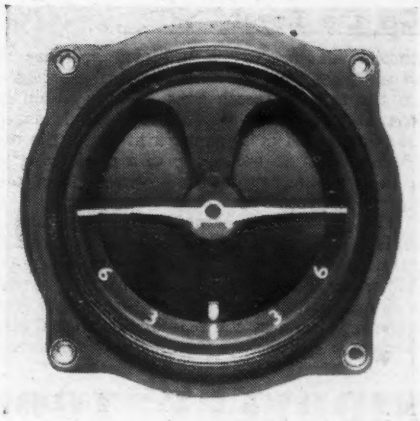
R.P.M.	2,400	2,500	2,600	2,700	2,800	2,900	3,050
Full throttle at sea level, rich mixture	90	93	96	99	101	103	106 b.h.p.
Full throttle at sea level, weak mixture	88	89	90	91	92		b.h.p.
Negative power intercept at zero density	8.5	9.0	9.5	10.5	11.0	12.0	13.5 b.h.p.

Cooling

Max. take-off cylinder temperature	185 deg. C
Max. continuous cylinder temperature	165 deg. C
Max. take-off oil inlet temperature	60 deg. C
Max. continuous oil inlet temperature	55 deg. C
Fuel	87 octane + 5.35 c.c. T.E.L./gall.

ON THE LEVEL

A New Electrically-actuated Gyro Horizon by Sperry



Although cleaned up in detail, the dial of the new electric gyro horizon conforms to the established presentation. A divided horizon bar is used to permit clearance of the front gimbal ring bearing.

THE artificial horizon, or gyro horizon, has been a member of the blind-flying instrument family for so many years now that one has grown to accept it, and its limitations, so naturally that it is almost with surprise that one learns of the advent of a new and improved version. In presentation, size and general appearance, the new Sperry instrument is essentially similar to its predecessors and, unless previously told, a pilot would not be aware of any change—until he started aerobatics: the change in performance would then become marked.

Previous designs of artificial horizon have all been vacuum-operated, and have thereby suffered certain operational limitations, particularly at high altitudes and during aerobatics. It was to overcome these limitations that the Sperry Gyroscope Co., Ltd., designed the H.L.3 electric artificial horizon. In the standard vacuum-operated horizon, the gyro assembly is enclosed in an airtight case, the interior of which is connected to a venturi. Reduction of air pressure in the interior induces an airflow through jets in the case directed on to notches in the rim of the gyro wheel, so that the induced airstream will spin the rotor at about 12,000 r.p.m. Understandably, with aircraft flying at great heights, the reduction in ambient density will affect the pressure differential through the case, and thus affect the driving air supply to the gyro. Fluctuations in ambient temperature and the filtration required to protect the delicate bearings from dust carried in by the airflow are troubles which do not attend the electric horizon. It is independent of air supply and operates with maximum reliability over a wide range of temperatures; additionally, the impossibility of dirt entering the instrument gives improved efficiency and considerably longer operational life.

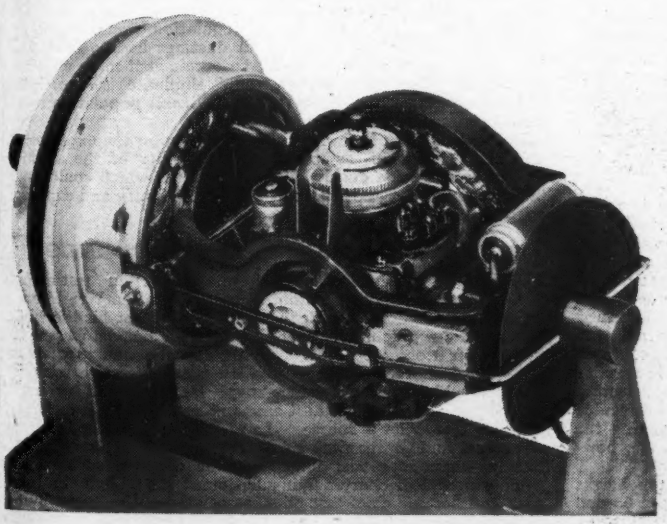
As well as improvements in operational conditions, the H.L.3 also offers improvements in operational range. The mechanical design of the normal vacuum-operated horizon was such that indications were limited to 90 deg. in roll from the horizontal and 65 deg. in pitch for climb and dive. For example, a half-loop and roll off the top involves changes of attitude beyond the limits of freedom of the ordinary gyro horizon, and, to overcome this, the gyro assembly must be caged, i.e., locked mechanically in position. Unfortunately, if uncaged when the aircraft is flying on anything but an even keel, the air-driven instrument will indicate a false horizon and, in addition, perhaps take some few minutes before it finally stabilizes to give correct indications. During this time, the pilot cannot rely on the instrument's truthfulness. If, on the other hand, the gyro is not caged before executing aerobatics, the instrument will topple, through what is known as gyroscopic lock, which occurs when the gyro spin and mounting axes become coincident.

Operational Improvements

Improvements have been effected in operational limitations with the H.L.3 electric horizon. It provides complete freedom in roll through 360 deg., and freedom through 170 deg. in pitch, i.e., up to 85 deg. climb and dive. This does not circumvent the possibility of toppling, but, in place of the mechanical caging normally employed, an electric erection system is used. Ordinarily, the gyro is erected to an accuracy of 2 to 3 minutes of arc at a rate of 3 to 5 deg./min., but when fitted in fighter aircraft, the H.L.3 horizon can be provided with an erection control switch to give rapid erection at the rate of 180 deg./min. By means of this, if the aircraft exceeds the gyro pitch limits of 85 deg. in climb or dive, the quick-erection switch can be operated to bring in fast erection for a brief period, thus almost immediately re-erecting the gyro to give correct indications. This quality is of very great value in that it quite eliminates the possibility of the instrument presenting the pilot with false data.

The gyro rotor consists of a three-phase, squirrel-cage induction motor, contained in a "cup" rotor of G.E.C. heavy alloy. This method of construction ensures that the weight of the rotor is concentrated as near to the periphery as possible, and so provides maximum inertia. This last quality is further enhanced by the rotational speed of 23,000 r.p.m.—nearly twice the speed of air-driven types—and, as gyroscopic inertia increases as the square of the speed of rotation, the inherent stability of this new Sperry horizon can be appreciated.

The rotor is carried in compound ball races compensated for temperature, so that the friction in the bearings remains constant throughout a wide range of temperatures. Electrical contact is made through the bearings. Any tendency for the gyro to drift, which may be caused by bearing friction or other factors, is overcome by the erection system, which



Shown here mounted on a test stand, the gimbal assembly of the instrument may be discerned. The gyro axis is normally vertical, and at the side and back of the instrument can be seen the stator windings of the erecting motors.

On the Level . . . . .

consists of mercury liquid-level switches at the bottom of the gyro housing, which control erection torque motors on the roll and pitch axes. This system means that the erection datum is a liquid-level, and, as the instrument horizon is always erected truthfully to the natural horizon, there is thus no possibility of a pilot being presented with a false datum, as can be given by the conventional air-driven horizon.

The gyro rotor assembly is supported in a gimbal ring which, in turn, is pivoted on the fore-and-aft axis in the case. Indication of the gyro vertical is given at the face of the instrument by a pointer bar and actuated by a sine-toggle linkage at the side of the gimbal ring. This is in halves, pivoted at the rear of the gimbal ring. A divided horizon bar is used to permit the bar to sweep over the sky plate without fouling the front gimbal ring bearing.

For ease of installation, the movement is contained in a case identical in size to that of the standard air-operated instrument and, from the point of view of installation, is therefore interchangeable with the latter. The instrument operates from a supply of 115v, three-phase, 400-cycle A.C., with a consumption of 15 vA.

A considerable amount of flying experience with the H.L.3 horizon has been accumulated during the past year. Service trials have been done with a squadron of Meteors, and long-distance trials are now being undertaken with the instrument fitted to R.A.F. Transport Command York aircraft. Among the civil aircraft to use the H.L.3 are the Ambassador, Hermes IV, Viscount, Apollo and the G.A. Universal, whilst Sperrys are delivering the instrument to Canada for installation in the Canadair IV aircraft for use by B.O.A.C.

SIDDELEY TROPHY RACE IN MIDLANDS

BY the evening of Friday, October 15th, twenty-five competitors had arrived at Wolverhampton for the Siddeley Trophy race, which was due to be run off on the following day. Two competitors had cancelled and another two were unable to get through owing to bad weather conditions *en route*. The meeting was due to start at 10 o'clock in the morning with one of the eliminating heats, and the second was due to start an hour later, with the final starting at 14.00 hours the same day.

Saturday morning, however, presented a dismal picture with the cloud about 150 feet above the airfield and with visibility less than 1,000 yards. Everyone was bitterly disappointed as there was little prospect of an improvement, and the organizers decided to postpone the event until the following day, although weather prospects were little better. Fortunately, the forecasters were wrong, and the weather on Sunday morning was comparatively good. Cloud base was high enough, the wind was 15 to 20 knots and visibility was good. During the morning the two heats were flown; they were won by Mr. A. L. Cole in a Comper Swift of the Luton Flying Club and Dr. L. H. Hamp in an Auster 5 of the Wolverhampton Aero Club.

After a close finish the final was won in the afternoon by Mr. W. M. Morris of the Midland Aero Club in an Auster J.1 at 124 m.p.h. Mr. A. L. Cole, winner of the first heat, was second at 122.5 m.p.h., and Dr. Hamp, winner of the second heat, was third at 115.5 m.p.h. The fastest time over the three-lap race of 66 miles was put up by Mr. R. R. Payne in a Miles Hawk Speed 6 at 179 m.p.h., and second fastest time was made by Mr. E. R. Pyatt in a Proctor 4. His speed was 150 m.p.h.

The Wolverhampton Aero Club offered a £10 prize for the best performance by a Club member; this was won by Dr. Hamp. Owing to the poor weather conditions there were only a few visitors from other clubs, but there were, nevertheless, some 500 spectators. Messrs. Rowarth and Dancy were responsible for the excellent handicapping which provided such an exciting finish to the final event. Mr. Mayne and Major-General Loughborough were the timekeeper and starter. The event was run under Royal Aero Club and F.A.I. rules and was, of course, sponsored by the Wolverhampton Club.

Prizes were distributed by Mrs. Oliver, wife of A. Cdre. J. Oliver, President of the Wolverhampton Club, who, incidentally, averaged 146 m.p.h. in a Proctor I in the final. Colonel Preston, of the Royal Aero Club, was one of the Chief Stewards and after the race paid a very complimentary tribute to the organizers for the success of the meeting. The winner started with a handicap of one minute, and the first aircraft off were the Tiger Moths, one of which unfortunately met with an accident right at the end of Heat 2. Mr. K. Moss, of the London Aero Club, was passing the finishing line very near the ground which he touched with his wheels, causing him to bounce into the air, his engine cut and he finished on his nose, luckily without injury to himself.

OPERATION "FROGHOPPER"

AN experiment in the use of the helicopter for dusting sugar cane was recently made in Trinidad, British West Indies. The helicopter used was a Bell 47D operated by Irvin-Bell Helicopter Sales, Ltd., on behalf of Caroni, Ltd., a company which has, among other sugar growers in Trinidad, been trying to find a satisfactory method of dealing with the froghopper, an insect pest which feeds on sugar cane and in some areas causes considerable damage. Ground equipment has so far been found unsatisfactory, because of the expense involved and the difficulty of covering a large acreage.

Preliminary experiments were carried out recently in order to determine the best rate of application of the insecticide, the best height and speed at which to fly, etc., and, following these trials, dusting over an area of 3,000 acres was carried out. The froghopper is a night feeder and hides in the sugar cane during the day. It will only come out before dusk if the temperature drops, and it retires to the cane at about 7 a.m. The best results were, therefore, obtained at night, when the strength of the wind was usually less than 5 m.p.h. Moonlight flying presented little difficulty, especially when the pilot was familiar with the fields and obstructions. Without a headlight, dusting in complete darkness is not considered practicable, as difficulty is experienced in seeing the top of the cane and gauging the correct height above it. Flights to and from base were, however, made in darkness without trouble.

When dusting, the helicopter was flown at cane-top height and at a speed of 20 m.p.h.; it was found that between 60 and 70 acres could be covered in one hour's flying. Reloading with insecticide took from half to one minute when the crew were trained. In good conditions the froghopper could be eliminated, but unfortunately, although the dust was forced right down through the cane by the downwash of the rotor, the residual effect of the insecticides used was most disappointing and apparently did no damage to the "nymph" or grub. This meant that, as the adult insect population would build up again in three or four days, repeat dustings had to be made. Far better results could no doubt be obtained if more effective insecticides were used, which would eliminate the necessity of frequent redusting. Nevertheless the insect population must have been considerably reduced.

From the point of view of the Bell helicopter the experiment was most successful, as it showed the ability of the aircraft to apply insecticide evenly over a large area which could only be covered slowly, and with considerable difficulty and expense, by other methods.

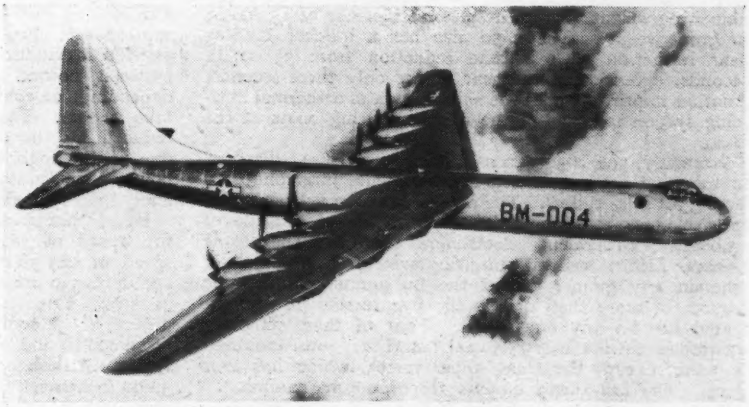
DEATH OF A.R.B's CHIEF TEST PILOT

WHILE temporarily engaged on production testing of Bristol Brigands at Filton, Douglas Dennison Weightman, chief test pilot of the Air Registration Board, lost his life when a Brigand in which he was flying crashed on October 14th, from about 1,000 feet. Mr. Weightman, who was 36 years of age, joined the R.A.F. in 1938 with a short service commission; he held an A licence since 1933. He completed two tours of operations with Coastal Command and in 1943 took the Empire Test Pilot's course. Later he was attached to the Structural and Mechanical Engineering Flight at the R.A.E., Farnborough, as a test pilot and was demobilized in 1946. After a period of charter flying he joined the A.R.B. in July, 1947 and became chief test pilot, associated with all test flying of prototypes and particularly with tropical testing. With 3,500 hours' experience of flying about 80 different types Mr. Weightman had been loaned to Bristol's, whose staff was depleted by holidays and sickness, by permission of the M.o.S. whose approval is necessary for testing of military aircraft.

AMERICAN PISTON-ENGINED BOMBERS

By "FAVONIUS"

THIS is the second in a series of three articles reviewing the aircraft authorized under the U.S.A.F. 70-Group Rearmament Policy. The first article, "ALL JET-FIGHTER AIR FORCE," appeared in FLIGHT, June 10th. The concluding article will review turbine-engined bombers.



CONVAIR B-36A HEAVY BOMBER.—"The biggest bomber in the world" is also probably the most vulnerable. Externally, it is noteworthy for its low-drag wing and partially-submerged six Pratt-Whitney Wasp Majors, driving pusher airscrews. Despite a fairly low overall drag, the power loading is high, and the altitude performance is inferior for future operational service as a long-range strategical bomber.

THE present state of flux in the design of high-speed aircraft, caused by the advent of the gas turbine, is well illustrated in the bomber category. While the all-jet fighter force is fast becoming an operational fact—at any rate in the U.S.A.—future bomber design is much less sharply defined, both in size and external configuration. Contrary to the colourful publicity which is such an engaging feature of the American scene, in actual fact the all-jet bomber force is still some way below the horizon, and the framework of current American strategical bomber policy is largely built around the well-tried Boeing B-29 Superfort and its post-war derivative, the B-50, both of which are piston-engined. The only serious jet contenders actually in limited production are the four-jet North American B-45 short-range tactical bomber and the Northrop B-49 eight-jet medium-range strategical bomber.

Boeing B-29

Intended to fill up new groups required for the recently authorized 70-group rearmament plan, hundreds of wartime B-29 bombers are now being de-pickled and de-cocooned from their post-war inactive status. (The difference between the two processes, it might be explained, is that "pickling" is a temporary anti-corrosive safeguard by special greases and oils for maintaining the aircraft in usable condition, whereas "cocooning" is the more permanent process of plastic airtight sealing developed for mothball storage.) Boeing has reactivated its Wichita plant for the modernization of these B-29s, the modifications including improved electronic equipment, pneumatic bomb-bay doors, a fuel-injection system and, significantly, provision for flight refuelling. Although the prototype was designed as far back as 1940, the B-29 has remained the world's top-ranking strategic bomber until the advent of the B-50 now coming into operational service.

With a normal gross weight of 120,000 lb, and powered by four Wright R-3350 Cyclones, giving 2,200 take-off h.p./engine, turbo-supercharged to a critical height of 25,000ft, the altitude performance is excellent even today. Maximum speed at altitude was originally expected to fall within the 365-370 m.p.h. bracket, but under operational conditions the top speed is now close to 350 m.p.h. at 28,000ft. Maximum speed at sea-level is approximately 280 m.p.h., initial climb 1,030ft/min (four engines), 480ft/min (three engines), service ceiling 32,000ft, and maximum range with 10,000 lb bomb load 4,800 miles. The average cruising speed for this range is about 260 m.p.h. at 25-30,000ft. (While, in general, the cruising speed decreases as the fuel is consumed, optimum range cruising is improved by gradually increasing the altitude with decrease in the gross weight, since the air mileage per gallon increases with height.) Landing speed with bombs away and fuel exhausted is about 80 m.p.h.

Boeing B-50

Virtually indistinguishable in general outline from its wartime progenitor, the B-50 packs a lot more power and is faster and longer-ranged than the B-29. Apart from the pouch-shaped engine nacelles, the most noticeable external difference consists of an increase in the vertical tail area, which adds about 5 feet to the height of the B-50 tail. This has meant the introduction of a folding device in order to reduce the overall tail height for hangar stowage. The real differences, however, are structural rather than aerodynamic, since about 75 per cent of the B-50 structure is an entirely new design, occasioned by the use of higher-grade aluminium-alloy, which permits consider-

BOEING B-50A MEDIUM BOMBER.—Latest lineal descendant of a long family line of big bombers the B-50 is now coming into U.S.A.F. operational service alongside the B-29 Superfort. Powered by four Pratt-Whitney Wasp Majors and well armed with five gun turrets, the altitude performance rates at the top of the piston-engined medium bomber class

American Piston-engined Bombers . . . . .

able wing-weight saving, despite an increase of 15,000 lb in gross weight. The B-50 also has a quicker landing gear retraction with a time reduction from 35 to 11 seconds, extension of the gear taking only three seconds. Another improvement is the substitution of a thermal anti-icing system in place of the rubber de-icing boots of the B-29.

Normally, the B-50 carries a flight crew of 11 disposed in fore and aft pressurized compartments interconnected by a 35-ft long tunnel. The air conditioning system maintains a 5,000-ft cabin altitude at an actual altitude of 25,000ft. Armament electronics comprise the same General Electric central gun-firing system as in the B-29, wherein any gunner except the tail-gunner can assume control of more than one of the five turrets for concentrated fire on any one target. Four of these remotely controlled turrets carry .50-cal. machine guns mounted in pairs, except the front upper turret, which has four guns. The tail turret mounts three 20-mm. cannon.

Four different types of the B-50 series have been announced to date. The B-50A is now in production and will be followed by the B-50B and B-50D, while the B-50C is a still later modification equipped with the new Pratt and Whitney compound engine. (The designation of the B-50C has now been changed to the B-54, in view of the extensive changes involved.) A total of 377 B-50s is now on order or delivered. The standard production B-50A is powered by four Pratt and Whitney R-4360-35 Wasp Majors, normally rated at 2,650 h.p., wet-boosted to 3,500 h.p. for take-off. Various altitude models of the Wasp Major are under development, with supercharger ratings all the way from 15,000 to 40,000ft, but, judging from the published performance data, the power plant of the B-50A, like that of the Wright Cyclone in the B-29, appears to have a critical altitude rating of 25,000ft.

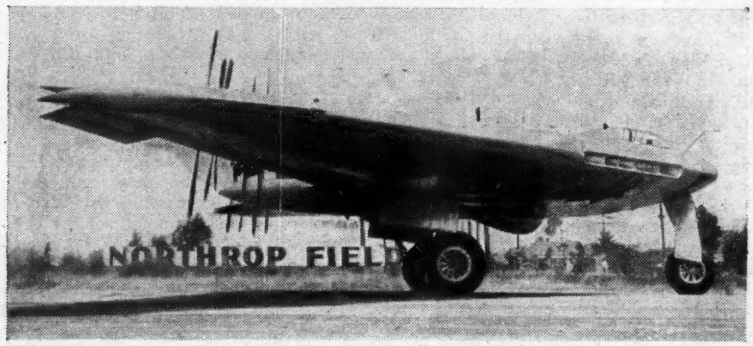
Incidentally, a point sometimes overlooked in this connection is that the engine manufacturer's rating is generally a bench figure, which neglects the effect of dynamic ram pressure across the intake manifold at speed and altitude. Thus, for example, an engine with a critical supercharger height of 25,000ft may be expected to develop maximum power at, say, 27-28,000ft when flying between 300 and 400 m.p.h., the actual height increment depending, of course, upon the ram efficiency of the intake system. The overall gain, however, is considerably reduced by the drop in airscrew efficiency at altitude, due to the high Mach Number of the blade tips. This point is mentioned in explanation of the quoted performance figures at altitude.

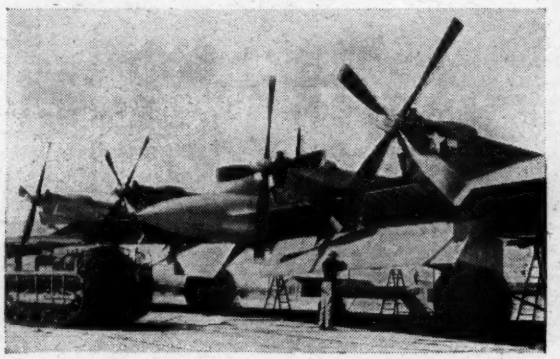
Based on a gross weight of 135,000 lb, the B-50A has a top speed of 385 m.p.h. at 28,000ft, average cruising speed of 285 m.p.h. at 25-30,000ft, maximum sea-level speed of 330 m.p.h., initial climb of 1,800ft/min. (four engines), 1,040ft/min. (three engines), and a service ceiling of 34,000ft. Maximum range with bomb loads of 10,000 lb and 20,000 lb is 5,800 and 4,600 miles respectively. Although the weight empty of the B-50 is some 5,000 lb heavier than that of the B-29 (due to the bigger power plant), the wing area is also slightly increased by larger flaps, hence the landing speed at the end of a bombing mission is still of the same order, namely, 82 m.p.h. The B-50, moreover, has the benefit of Curtiss electric reverse-pitch airscrews which cut down the landing run appreciably. In the event of a full-load emergency landing, the respective landing speeds of B-29 and B-50 are approximately 104 and 110 m.p.h.

Convair B-36

Widely publicized as "the world's biggest bomber," the six-engined Convair B-36A is also in limited production at the Fort Worth, Kansas, plant of Consolidated-Vultee. While the current production run of 95 has recently been confirmed by Air Secretary Symington, it is no secret that the Air Force itself has blown first hot, then cold, upon this ambitious project. There is a strong feeling in technical circles that this wartime behemoth is now largely outdated by virtue of its power plant performance and vulnerability. This is meant as no reflection on the excellent reputation of the Pratt and Whitney Wasp Majors, but even a battery of six of them strikes one as working a bit under duress, when allied to a normal gross weight of 278,000 lb, and an overload gross weight of 300,000 lb, as recently flown. In the writer's opinion, the B-36 airframe has far outstripped its power plant and is hardly capable of future development as a first-line combat aircraft.

On the basis of recent tests at approximately 300,000 lb, the B-36A is good for an 8,000-mile range with a 10,000-lb bomb load, which is a considerable drop from earlier claims of 10,000 miles. (With the maximum bomb capacity of 72,000 lb, the corresponding range is about 4,500 miles.) Top speed at 28,000ft is close to 320 m.p.h., while the average long-range cruising speed is approximately 250 m.p.h. at 25-30,000ft, and the service ceiling 30,000ft. At the end of a 3,000-mile target radius, and in the face of a stiff 600 m.p.h. jet-fighter, radar-directed defence, the biggest bomber in the world looks exceedingly vulnerable, despite its heavy defensive armament of eight turrets, each mounting a pair of 20-mm cannon. Tacit confirmation of this diagnosis may be read in recent proposals to carry its own protective fighter offspring (the McDonnell XF-85) in the bomb bay, a complication which is



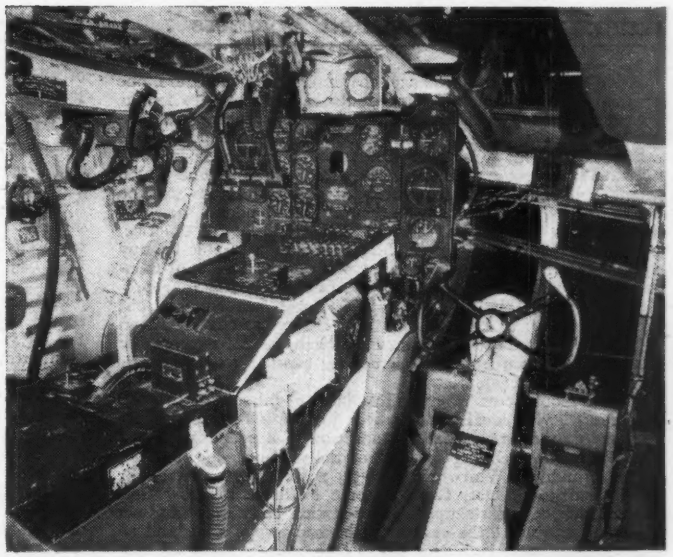


NORTHROP B-35 HEAVY BOMBER.— Powered by four Pratt-Whitney Wasp Majors fully submerged in the wing, the operational shake-down of this aircraft has been delayed, due to failures with the original eight-bladed dual-rotation pusher airscrews. These two views show the original contra-props and the temporary change-over to single-bank paddle-bladers. Armament comprises six gun turrets.

bound to reduce its combat effectiveness still further. Biologically speaking, all this patchwork solution seems to be heading for a Darwinian dead-end.

Northrop B-35

Poised about half-way up the weight scale between the B-50 and the B-36 is the Northrop B-35 piston-engined all-wing bomber, designed for a normal gross weight of 165,000 lb, with overload up to approximately 220,000 lb, and again powered by four P.W. Wasp Majors. This highly original—and equally controversial—aircraft has been plagued with a long series of contra-prop troubles, but is now flying again with a set of single-bank paddle-bladers. Of the original order for 15, two have been converted into the YB-49 jet-powered version, of which more later. The B-35 and B-36 are interesting examples of two opposite design trends—the flying wing versus the flying stick. "Talk softly, but carry a big stick," said an earlier Roosevelt, and the B-36 has been widely acclaimed as the aerial exponent of that tradition. It looks, however, as if the big wing is now beating the big stick, since current reports indicate that Convair will build the jet version of the flying wing under a Northrop licence agreement.



PILOTS' BOUDOIR.—Although this is actually a view of the Northrop B-49 pilots' cockpit, the general layout is similar to that of the B-35. The most noticeable difference is the grouping of the engine throttles: in place of four separate throttles for individual control of the four piston-engines of the B-35, the jetted B-49 has a simplified arrangement of only two throttles, one for each bank of four port and starboard jets.

A token of the high structual efficiency of the all-wing configuration is evidenced by an empty weight of 89,000 lb for the B-35, which represents about 40 per cent of the overload gross weight of 220,000 lb. This is reflected in an excellent load-range performance of 8,400 miles with a 30,000-lb bomb load. Assuming that sufficient tankage capacity can be found available in the present wing structure, analysis shows that a 10,000-mile range with 10,000 lb of bombs is hypothetically possible when associated with this gross weight of 220,000 lb; since, however, this would mean a fuel capacity not far short of 18,000 U.S. gallons, one must treat this assumption with considerable reserve. As it is, the upper range limit of 8,400 miles is estimated on a maximum fuel capacity of approximately 14,000 U.S. gallons, which in itself would be quite an achievement for a wing-sans-body structure containing a fully submerged power plant.

Further tribute to the efficiency of the all-wing concept is shown by evaluating it against the performance of the B-36. Thus, the four-engined B-35, when flown at any weight within the 200,000-220,000 lb overload category, more than matches the six-engined B-36 at 300,000 lb. At the full overload condition of 220,000 lb, the maximum speed of the B-35 is roughly equal to that of the B-36, namely 329 m.p.h. at 28,000ft, but the average cruising speed for optimum range is higher by some 20 m.p.h. (270 m.p.h. for the B-35 against 250 m.p.h. for the B-36); further, the maximum range with a 30,000 lb bomb load is actually greater than that of the B-36 with 10,000 lb of bombs—namely, 8,400 versus 8,000 miles, as already noted above. On a comparable bomb load basis of 30,000 lb for both aircraft, the range of the B-36 drops to 7,000 miles. Under these conditions, about the only scoring point for the B-36 is a higher service ceiling—30,000ft against 27,000ft for the B-35.

A fairer basis of comparison for long-range bombing is the respective performances with the same bomb load of 10,000 lb—in which case the overload gross weight of the B-35 may be reduced to 200,000 lb. On this footing, "the wing" beats "the stick" on all counts by a handsome margin; for example, the top speed of the B-35 now becomes 345 m.p.h. at 28,000ft, the maximum range 9,000 miles (again assuming a fuel capacity of about 14,000 U.S. gallons), and service ceiling 30,000ft. (The logical inference from all this is that the B-36 is carrying an extra pair of engines—plus a parasite fighter escort—to the target, in lieu of bombs or fuel!) Incidentally, at this point, a further comparison with the B-29 is invited: at 200,000 lb, the B-35 has practically the same altitude performance as the B-29, but nearly double the range with the same bomb load; on top of which the B-35's take-off and initial climb are distinctly superior.

While from this analysis it looks as if the B-36 has been rendered obsolete by the B-35 flown at the higher weights, the B-35 also compares very favourably at its normal gross weight with the B-50. At a gross weight of 165,000 lb the B-35 develops a performance of the following order: maximum speed 375 m.p.h. at 28,000ft; average cruising speed 275 m.p.h. at 25-30,000ft; initial climb 1,530 ft/min. (4 engines); 930 ft/min. (3 engines); service ceiling 35,000ft; and maximum range with 10,000-lb bomb load 6,200 miles. Thus, although both the top and cruising speeds are down by some 10 m.p.h., the bombing range with the same load as the B-50 is slightly better. Furthermore, because of the lower wing-power loading of the B-35, its take-off distance to clear 50ft is only about 1,500 yards, as against over 2,000 yards for the B-50—an advantage which more than counterbalances the faster sea-level climb of the latter.

PERFORMANCE COMPARISON

Aircraft: (Power Plant)	Gross Weight (lb)	Speed at Altitude: Maximum (m.p.h./ft)	Speed at Altitude: Cruising (m.p.h./ft)	Initial Climb (ft/min)	Service Ceiling (ft)	Bomb Load/Range (lb/miles)
Boeing: B-29 (4 Wright R-3350)	120,000	350/28,000	260/25–30,000	1,030	32,000	10,000/4,800
Boeing: B-50A (4 P. & W. R-4360)	135,000	385/28,000	285/25–30,000	1,800	34,000	10,000/5,800 20,000/4,600
Convair: B-36A (6 P. & W. R-4360)	300,000	320/28,000	250/25–28,000	700	30,000	10,000/8,000 30,000/7,000 72,000/4,500
Northrop: B-35 (4 P. & W. R-4360)	165,000 200,000 220,000	375/28,000 345/28,000 320/28,000	275/25–30,000 270/25–30,000 270/25–28,000	1,530 1,130 900	35,000 30,000 27,000	10,000/6,200 10,000/9,000 30,000/8,400

American Piston-engined Bombers . . .

Aside from the performance characteristics, there are one or two less tangible, but more controversial, features in the present Northrop scheme of things—some of which will undoubtedly be smoothed out by further development, while others, again, may be more fundamental to the basic aerodynamic conception. In the first group there is one which might well be eliminated by a slight departure from the 100 per cent all-wing ideal. This concerns the pilots' view, or look-out, as typified in current B-35 and B-49 practice, wherein the first pilot sits slightly raised in a bubble canopy some way aft of the leading edge, with the second pilot-navigator alongside, but lower, entirely flush within the wing profile. On paper, the first pilot's view looks fair enough, but in actual practice the look-out from the cockpit is restricted in certain directions. Far worse, though, is the case of the second pilot, since from an operational aspect, his look-out is practically non-existent.

It is a moot point whether this faithful pursuit of the 100 per cent all-wing ideal has not been pushed a bit too far, for it seems to the writer that the addition of a properly shaped cockpit bulge extending forward of the leading edge (as seen in the Armstrong Whitworth AW-52) is well worth any slight drag penalty; in fact, there is some evidence to show that the addition of a fair-shaped centre-section body may improve the flow pattern at the centre of the backswept wing and so raise the critical Mach Number. One cannot think of any single feature more likely to condemn a combat aircraft in the eyes of the ordinary military pilot than an inadequate view. On top of this criticism one ventures to add a further one closely associated with it: the internal cockpit layout needs tidying up quite a lot. We are all for clean-cut aerodynamic tailoring, but we are also firmly in favour of giving the pilot a neat lining on the inside of the suit!

In the second group, a more fundamental aerodynamic problem looming sharply over the horizon is the relationship of wing thickness to compressibility phenomena in the high-speed, high-altitude, régime of future bombers. Stated simply, the problem boils down to the opposing claims of the thin wing for high speed against the thick wing for fuel stowage. Because of the high overall thickness/chord ratio of the all-wing layout, the compressibility drag rise is likely to be mountainous in the region of M=0.75 (500 m.p.h. at 35,000ft), a fact which concerns the jet-powered B-49, rather than the B-35, of course. A number of other designers with whom I have discussed the pros and cons of the all-wing type seem to feel that, as thin wings are the stable companion of high speed (or rather high Mach Number), the current type of all-wing geometry has obvious limitations when applied to jets. Sweepback will lengthen the cul-de-sac, but the alley—so say the orthodoxists—is still a blind one.

None the less, in the piston-engined class, the B-35 is an outstanding contribution to the aeronautical engineering art and a tribute to the tenacious heterodoxy of its designer. By virtue of its remarkable combination of structural and aerodynamic qualities, this aircraft can double in the role of either medium- or long-range bomber with a performance equal to or better than any of its contemporaries restricted within their respective boundaries because of range limitations. In the medium class, it has certain advantages, particularly range, over both the B-29 and its family successor, the B-50; while at the upper end of the weight scale, it thoroughly obsoletes the B-36. It is all the more regrettable, therefore, that power plant troubles (more particularly airscrew gear-box failures) have delayed its development short of the operational shake-down phase.

Purely from the performance standpoint, at any rate, the substitution of four-bladed airscrews for the troublesome eight-bladers cannot have improved the overall propulsive efficiency. The evidence, in fact, points all the other way, for even high-solidity paddle blades must require a larger diameter than equivalent contra-props, and the difference in Mach Number of the blade tips is probably worth at least another 10 m.p.h. to the top speed at altitude; thus a return to smaller-diameter contra-props would put the B-35 back in the 385-390 m.p.h. class along with the B-50. The B-50, however, also appears to be penalized at present by ill-fitting orthodox four-bladers, the blade tips of which almost overlap their immediate neighbours, a restriction presumably due to the change-over from the smaller power plant and airscrews of the B-29.

On which controversial theme or two we will adjourn the piston-engined side of the argument and postpone discussion of the Northrop B-49 for treatment along with the rest of the jet bomber stable in the next article. For easy visual reference and comparison, a tabulated summary of performance data on U.S. piston-engined bombers is given on page 483, the figures being diagnosed from published sources, plus the help of the writer's own slide-rule to fill in the gaps. Looking back over this phase of bomber development, it seems fairly safe to claim that in the Boeing B-29 and B-50, and the Northrop B-35, the U.S.A.F. need not fear any comparison with the rest of the world at this time.

TOGETHER AGAIN

TWO brothers who were pioneers in British aviation are in harness together again after many years. Sir Alliott Verdon-Roe has become chairman of Gerrard and Co., Ltd., of which firm Mr. H. V. Roe is managing director. The firm is, perhaps, best known to the aviation world through Roe's Laminated Aluminium, which was first used by de Havillands.

During the early years of Avros it was "A. V." who did the designing and "H. V." who looked after the financial side. During 1917 the firm was busy turning out Avro 504s, but the three works were running so well that "H. V." decided that he could be spared, especially as he was then a bachelor (later he married Dr. Marie Stopes), and he joined the R.F.C. He was injured and to this day has trouble with a leg. "A. V." (we beg his pardon, Sir Alliott), at the age of 71, is as agile as ever, even to the extent of being still able to ride a bicycle *backwards!*

A COMPREHENSIVE POLICY

THE impressive system of service afforded by the makers to operators of Rolls-Royce aero engines, greatly revised and supplemented to cater for civil as well as military needs since the end of the war, is described in a new booklet issued by Rolls-Royce, Ltd.

Field service engineers experienced in engine maintenance are allotted by the Aero Service Department to civil or military customers in all parts of the world, and in some cases to major airports where their services are available to all Rolls-Royce operators. Repair engineers are capable of advising on all aspects of overhaul, and are normally allotted to all customers who carry out their own overhauls. Both classes of engineer are responsible for submitting regular reports to their Department H.Q., enabling the makers to keep themselves fully informed on the behaviour of their products. Specialist engineers to conduct on-the-spot enquiries into unusual problems assist the Aero Service H.Q. staff in accumulating performance information for study by specialists of the Technical Service Dept., who also work directly with the operator when necessary. Separate sections of this department maintain efficiency in repair engineering, introduction of modifications, the quality of power plants and components, and the accuracy of servicing instructions.

A substantial part of the Government shadow factory at Glasgow is used by Rolls-Royce for the complete overhaul of large numbers of Merlins and Griffons. This factory was built to increase Merlin production, and 50,000 were manufactured or repaired there during the war. An interesting feature of the service is that owners of engines and power plants pay for overhauls on the basis of hours run since new or last overhaul, thus enabling early estimation of reconditioning costs to be made.

A spare parts service is responsible for the quick despatch of spares to all parts of the world. Instant identification of spares packages regardless of language spoken is allowed by labels bearing an illustration of the packed component.

Instruction courses on operation and servicing are held in the company's own self-contained school at Derby, and repair courses are given in the Glasgow factory.

BASIC SCIENCE

DETAILS of the elaborate testing procedure for passenger seats adopted by Consolidated Vultee are given in an article in the November issue of *Aircraft Production*. The seats are mounted in a so-called "dynamic cycler" which subjects the cushions to 100,000 separate impressions of what are termed "standardized human buttock-forms" moulded in plaster. Cushion-thickness measurements are taken before, during and after the test by means of a "multiple indentor," consisting of 23 wooden rods resting endwise on the cushion and loaded to a total distributed weight of 125lb.

In a further test, the seat is mounted on a vibrating table, one of the plaster casts placed upon the cushion, and the magnitude of the transmitted vibration measured by an accelerometer superimposed on the cast.

HERE AND THERE

Air Exports to Australia

EXPORTS from the U.K. to Australia carried by B.O.A.C. and Qantas Empire Airways services during August amounted to nearly 40,000 lb compared with 18,800 lb in August, 1947. The increase is largely due to the export of samples and goods to be used in connection with the forthcoming Royal visit to Australia.

U.S.A.F. Recruiting Call

AN appeal for 10,000 pilots, navigators and ground staff to return to the U.S. Air Force has been made from Washington. The additional men are required for service in Western Europe to replace those who have completed their overseas tours of duty or who have served their time. They are principally required to work on the Berlin operation.

R.A.F. Boxing in Denmark

A ROYAL AIR FORCE boxing team opened a Scandinavian tour on October 14th at Copenhagen. They were defeated by their Danish opponents who won six out of the nine bouts decided. The visiting team were regarded as one of the best ever to visit Denmark, but found several of Denmark's leading amateur boxers in top form, and all the fights were characterized by their extreme speed. The R.A.F. won a middleweight and two featherweight bouts.

TRYING THE HOPPI-COPTER: Capt. R. N. Liptrot, Deputy-Director of Research and Development, is strapped in the seat before making a "tethered" flight.

BOOKING FOR S. AMERICA: B.S.A.A.'s new booking offices at 9-11, Albemarle Street, London, were opened at a cocktail party on October 15th. The model of the S.R.45 affords a glimpse of future travel attractions.

Fairey's Launch Canadian Branch

WITH a capital of one million dollars a new company, entitled the Fairey Aviation Co. of Canada, Ltd., has been formed by Fairey's, who have purchased from the Canadian Government the Clarke Ruse factory at Eastern Passage, Nova Scotia. Initially this plant will be used for the repair and maintenance of Fairey aircraft in service with the Royal Canadian Navy; it will also be used for the manufacture and service of other products of the Fairey Group. Mr. Charles Hibbert, M.B.E., who joined Fairey Aviation in 1919, has been appointed general manager of the new Canadian Company.

Mr. Charles Hibbert, M.B.E.

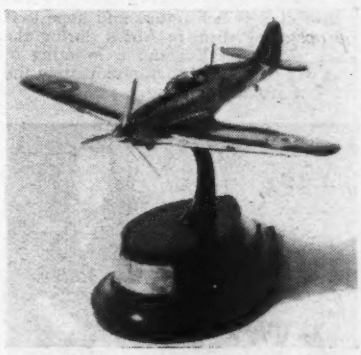
The appointment is also announced of Brig. I. C. A. Robertson to the Fairey Company. His last appointment before retirement from the Army was as Military Adviser to the Director of Guided Weapons.

Ford-engined Chilton

S/LDR. R. L. PORTEUS has installed a Ford 10 h.p. engine in a Chilton. The only modifications are a double row of plugs and the replacement of the coil by two magnetos. This modified Chilton now cruises at 105 m.p.h.

New U.S. Navy Fighter

NOW undergoing flight tests at the U.S.A.F. test centre at Muroc Dry Lake, California, is the first Douglas fighter to be built for the U.S. Navy. The Douglas XF3D-1 Skynight, as it is called, is powered by two Westinghouse gas turbine jet engines; it is a two-seater of considerable versatility, being adaptable for fighter offensive, fighter-bomber, and escort fighter duties, besides long-range or reconnaissance patrols. The pressurized cockpit has air temperature control and the Skynight is equipped with hydraulic dive brakes which extend outwards from the fuselage just forward of the tail unit. Another unusual feature is an escape hatch which permits the crew to make its exit through the floor at high speeds.



RECOGNITION TROPHY: A silver model of a Hurricane which is awarded for the annual All-England Recognition Contest which, as reported in "Flight," October 14th, will be held on January 19th, 1949.

Silvaire Cropmaster

THE President of the Luscombe Airplane Corporation, Mr. L. H. P. Klotz, has announced that development has been started of a specialized aircraft specifically designed as a farm implement for crop spraying. The "Cropmaster," as it is called is expected to be ready for the start of the spraying season next spring. Of all-metal construction the Cropmaster will be powered by a 90 h.p. Continental engine and will have a

HERE AND THERE

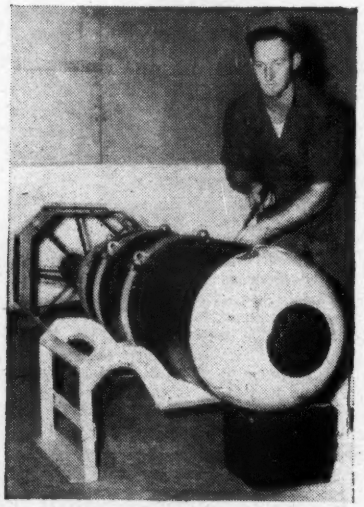
stalling speed of under 40 m.p.h. plus outstanding manœuvrability and angle of climb. An experimental version of the machine without spray equipment has been flown by two of the largest spray operators in the Middle West who report very favourably on its performance.

First-hand Experience

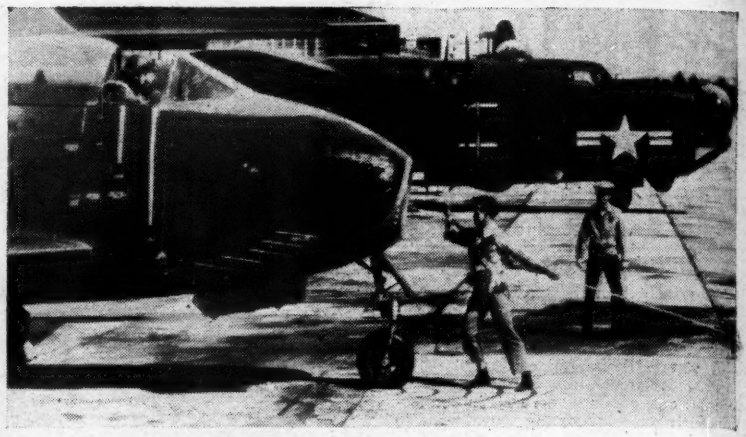
AMONG the passengers who were in the Mercury Airways' D.C.3 which came down 175 miles south of Wadi Halfa last week was Mr. J. J. Gerritsen, Chief Engineer of Tiltman Langley Laboratories, Ltd. Mr. Gerritsen who was on his way to his home in Johannesburg for a holiday was fortunately unharmed. For the past seven or eight years Mr. Gerritsen has been working on problems connected with aircraft fires in flight and crash fires.

Helicopter Spraying in Sudan

SPECIALLY fitted with crop-spraying apparatus by Pest Control, Ltd., Cambridge, a Westland Sikorsky S.51 helicopter has been shipped to the Sudan after extensive trials in this country. The first experiments in spraying cotton crops in the Sudan, as protection against insects, will take place in the Blue Nile province, near Turabi; Mr. J. Harper, Pest Control's chief pilot, began the trials on October 12th. The S.51, which normally carries three persons, when fitted with the spraying gear carries only the pilot, who operates the spray. Sufficient insecticide for 20 minutes' work is carried in a 70-gallon tank. It is estimated that about 400 acres a day can be covered. Pest Control have ordered a fleet of S.51 helicopters and hope that by operating them in Africa during the slack season in England a lowering of cost will be effected to approximately the level of ground spraying.



HEAT-SENSITIVE BOMB : This VB-6 heat-directed bomb carries a mechanism in the nose which reacts to heat and is linked to guiding apparatus which directs it on to targets which reflect more heat than their surroundings, such as ships and factories. It has been reported that the mechanism reacts even to a lighted cigarette moved across in front of it when on its stand.



SUCTION TESTS : To determine how close a person can stand to the intake of jet engines, Lt. A. L. Hall of the U.S. Navy undertook this experiment with a stout line attached to his body. The danger area was found to be within two to three feet around the intake scoop. The test followed the death of a mechanic in California who went too close to an intake pipe.

News in Brief

THE public enclosure at London Airport closed at dusk on October 10th. During the seven months it has been open nearly 275,000 people have paid for admission. Last year 246,569 people passed through the enclosure which was only open for four months.

* * *

According to the Boeing Company European based Superfortresses have been making routine training flights for nearly a year to an American base in Arabia, near Dhahran on the Persian Gulf. These flights are said to be safeguarding American interests in the Saudi Arabian oilfields.

* * *

Curtiss-Wright Corporation of America has been using a modified B-17 Fortress for high altitude tests of the new T-35 Typhoon airscrew turbine engine, which has been designed for long range bombers. The T-35 installation is in addition to the usual four engines.

* * *

At the board meeting of the Fairey Aviation Co., Ltd., on September 30th, a dividend for the year ended March 31st, 1948, was recommended for confirmation at the general meeting to be held on October 27th, 1948, of 2s per share less income tax at the rate of 9s in the pound. This is the same rate of dividend as for the previous year.

* * *

To test the possibilities of firing V2 and American rocket projectiles horizontally from ships, the U.S. Navy is carrying out trials in the Atlantic with the former seaplane tender the *Norton Sound*. Since the experimental rocket range in New Mexico has only been suitable for vertical firing of rockets, the "floating laboratory" has been selected for horizontal tests.

* * *

G/C. W. N. Cumming, O.B.E., D.F.C., A.F.R.Ae.S., F.R.Met.S., has become a partner in the firm of Heenan, Winn and Steel, consulting engineers and designers of the Planet Satellite. He has resigned as managing director of Straight Aviation Training and also given up his directorship in other companies of the Straight Group.

An appeal has been sent by telegram from Germany to His Majesty the King protesting against the continued use of Heligoland for practice bombing. In its present damaged condition the island could contribute nothing to German economy and is said to be the only suitable target for the training of bomber crews.

* * *

Previously Senior Technical Officer on gas-turbine performance analysis in the Directorate of Engine Research and Development with the Ministry of Supply, Mr. Philip L. Sumner, B.Sc., A.F.R.Ae.S., A.M.I.Mech.E., has resigned his position and taken up an appointment on the Higher Technical Staff of the department of Air Transport at the Science Museum.

* * *

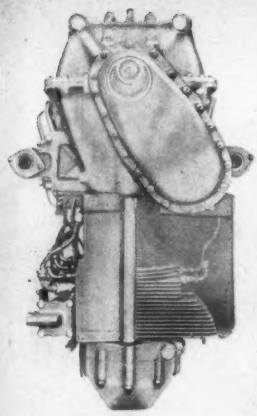
Mr. T. H. Y. Bonsey, D.F.H., A.M.I.E.E., of the British Aluminium Co., Ltd., who was seconded to the Control Commission in Germany in 1945, has relinquished his appointment to become sales manager of the Aluminium Wire and Cable Co., Ltd., of Swansea and London. Mr. C. H. E. Ridpath, B.Sc., A.M.I.E.E., A.M.I.Mech.E., has been appointed deputy sales manager.

* * *

Reports from Washington state that two American warships which were subjected to atom bomb tests at Bikini nearly two and a half years ago are still radio-active. They are shortly to be taken out to sea and sunk. Of the 76 ships involved in the test only 12 remain afloat, four of which have been returned to active service.

* * *

A. Cdre. A. H. Wann, one of the few remaining airship pilots, died in the South of France on October 11th. He commanded both the R 36 and the R 38 airships and was the sole survivor in the forward portion of the latter when it crashed in flames near the Humber in 1921. He served as A.O.C. Malta during the war and subsequently in the Directorate-General of Personal Services at the Air Ministry. He retired from the R.A.F. in 1946.



CIRRUS BOMBARDIER

Analysis of the Latest Cirrus Engine : Direct Fuel Injection : Low Specific Consumption : Excellent Power/Weight Ratio

IN introducing their new range of Cirrus engines, Blackburn Aircraft, Ltd., have, very wisely, held to the classic formula of inverted, air-cooled, in-line configuration upon which the Cirrus reputation has been so firmly based. However, a breakaway from former practice is made by the use of direct fuel injection in place of the more conventional carburation system of induction. This development has made possible an increase in power of 25 b.h.p. over the well-known Cirrus Major Series III of almost identical size, but with normal induction.

There are three engines in the new range, respectively, the 180 b.h.p., Bombardier 4-cylinder, normally aspirated unit; the 265 b.h.p., Musketeer 6-cylinder, normally aspirated unit; and the 320 b.h.p. Grenadier 6-cylinder supercharged unit. Of these, the Bombardier is the furthest advanced, although work on the Grenadier is also proceeding rapidly; however, the Musketeer is not at present receiving quite the same meed of attention as, so far, the demand for a unit of this power category is less marked than for its smaller and larger brothers. In view of the state of development, we propose in this article to deal only with the Bombardier.

Quite some time ago, the engine division up at Brough began to devote their attention to the subject of direct fuel injection, and, having met with some degree of success, were given a development contract by the Ministry of Supply. Rather than produce a single-cylinder test unit, useless for anything other than the establishment of test data, it was decided that a full-scale, 4-cylinder engine should be produced, for which some useful future might be foreseen. Official approval of this course was given.

Design and Performance Improvements

Having a sound design of established reliability already in existence in the Major Series III engine, there seemed little point in going to the extravagance of creating an entirely new design. However, the opportunity was taken to effect refinement in details and, at the same time, to change over to English measurement from the erstwhile Cirrus precedent of metric dimensions. Thus it is that although the Bombardier and Major Series III engines are similar in type, size and weight, the new engine is dimensioned to the nearest English "round figure" equivalent above the earlier engine's metric size. For example, the 120-mm cylinder bore of the Major gives place to a 4.8in (approximately 122 mm) bore in the Bombardier. Strokes remain the same at 5.5in and 140 mm.

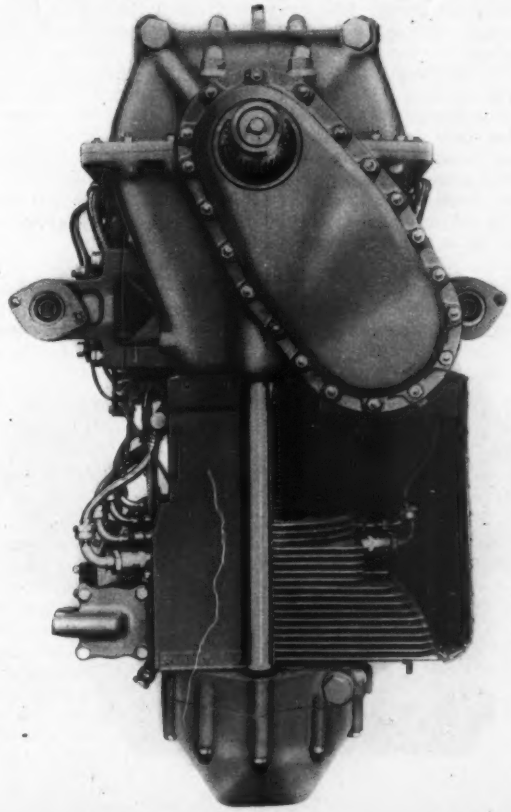
There are many other points of difference between the two engines, but they are so alike in essentials that the disparity in their power outputs would seem to argue a telling case for the employment of fuel injection. Certainly, the compression ratio has been increased from 6.5 to 7.0 : 1, but in addition to achieving an increase in take-off power from 155 b.h.p. to 180 b.h.p., a worthwhile reduction has also been made in specific fuel consumptions. The values baldly stated by the performance and consumption curves tell, without embellishment, of an achievement of which those up at Brough may well feel proud.

The Bombardier is the first British engine employing direct fuel injection to have passed the Air Registration Board's approval tests. A total of 250 hours' running time under type test conditions was divided as 150 hours for the engine and 100 hours for the airscrew, but, apart from this, something like 750 hours' running has been done on the bench. Flight trials are due to start almost immediately and, for this purpose, the engine will be installed in a Miles Messenger airframe.

Elektron magnesium alloy is used extensively in the Bombardier, the crankcase, front cover, wheelcase, valve-carrier plate and valve chest all being sand-cast in this very light material—a major contributory factor toward the high power/weight ratio which characterizes the engine. The crankcase is split horizontally on the crankshaft axis, with waisted studs on each side of the main bearings for retention of the top cover, in addition to through-bolts uniting the meeting flanges. Integral webs carrying the main bearings are pierced with limber holes at the base and with lightening-cum-breathing holes through the main web diaphragms. The main bearings themselves are normal, lead-bronze lined, split steel shells.

Although the crankshaft is a conventional enough E.N. 25C/S. 81 forging with hollow journals and crankpins, it has novel features in its lubrication tracts and thrust bearing. The transference of oil from the intermediate main bearings to the crankpins is made via 22 gauge $\frac{1}{4}$in bore copper pipes which, after insertion, are subjected to an internal pressure of 5,000 lb/sq in which causes them to swell and so become locked by expansion in the bores of the main journals and crankpins.

This frontal view of the engine complements the side elevation shown on the following page, and well illustrates the compactness of the design.

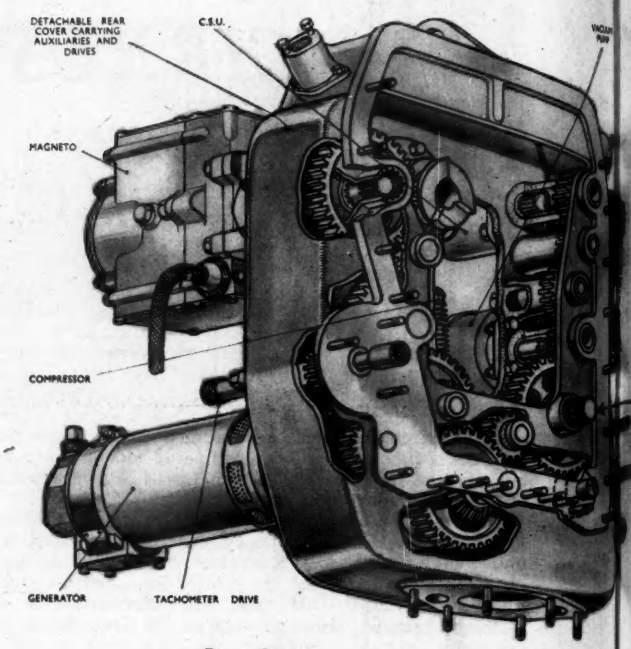


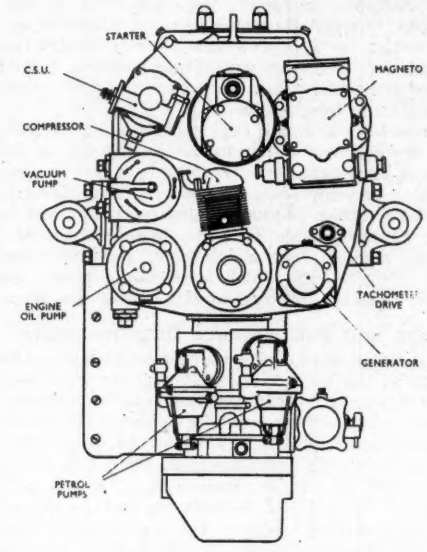
CIRRUS BOMBARDIER . . .

Instead of the conventional ball-type thrust bearing, the Bombardier crankshaft is furnished with two collars or flanges which divide the front main-bearing area into three sections. These flanges register in annular troughs which are faced with bearing surfaces fashioned integrally with the main-bearing shells; these are lead-bronze lined, steel units, the front and rear members being of angle-section, whilst the central member is of channel-section. Oil is supplied to both bearing troughs to form a film to the thrust-bearing faces as well as to the main journals. A synthetic-rubber cup-seal prevents oil leakage at the forward end of the bearing, but the oil is free to weep rearward from the bearing into the crankcase, where it is scavenged in common with the remaining lubricating oil. The chief reason for the adoption of this form of thrust bearing was to by-pass the difficulties always associated with the combination of ball-bearings with plain bearings. Although only 1,000 hours of running has been done by the Bombardier, no hint of trouble has been experienced with the thrust bearing, and Mr. Mitchell is satisfied that it will continue to prove completely successful.

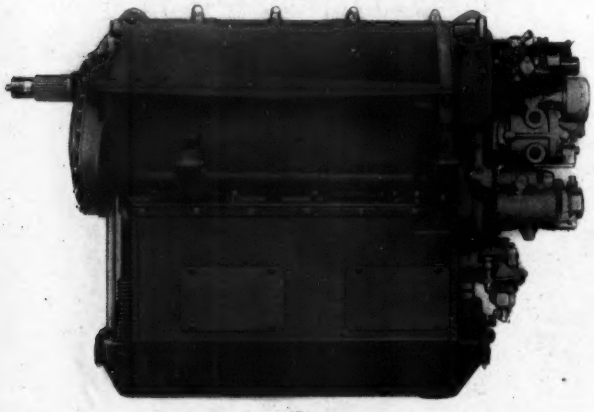
Cylinders are machined from forged billets of S.70 and are each anchored to the crankcase with eight studs piercing a flange surrounding the skirt. The bores are ground-finished, whilst the cooling fins at $\frac{3}{16}$in pitch are taper-machined to a mean thickness of 1/20in. For attachment of the head, the cylinder is externally threaded 12 t.p.i. Whit. for a little over $1\frac{1}{4}$in. The cylinder heads are sand-castings in L35, with generous finning at the exhaust side. The combustion chamber mouth which, of course, is threaded for union with the cylinder, is chamfered on its outer diameter for marriage with an internally chamfered locking ring, first threaded separately on the cylinder. When cylinder and head have been tightened together, the locking ring is, in turn, tightened against the head, the purpose being chiefly to effect a seal; however, this does secondarily provide physical locking, although the different coefficients of expansion between head and cylinder should nominally look after this.

Connecting-rods are robust, parallel, H-section L.40 forgings, with four-bolt plain lead-bronze steel-backed split bearings at the big ends, and plain-bored little ends in which the gudgeon pins bear direct. The gudgeons themselves are simple ground-finished hollow pins, retained by circlips against thrust washers to each cheek of the piston. These last are flat-crown L35 pressings of semi-skirted type, grooved for two plain compression rings and an H-section scraper ring in a triple gang below the crown. To keep down reciprocating mass moments the pistons are machined away beneath the crown and in the gudgeon walls to a generous degree.



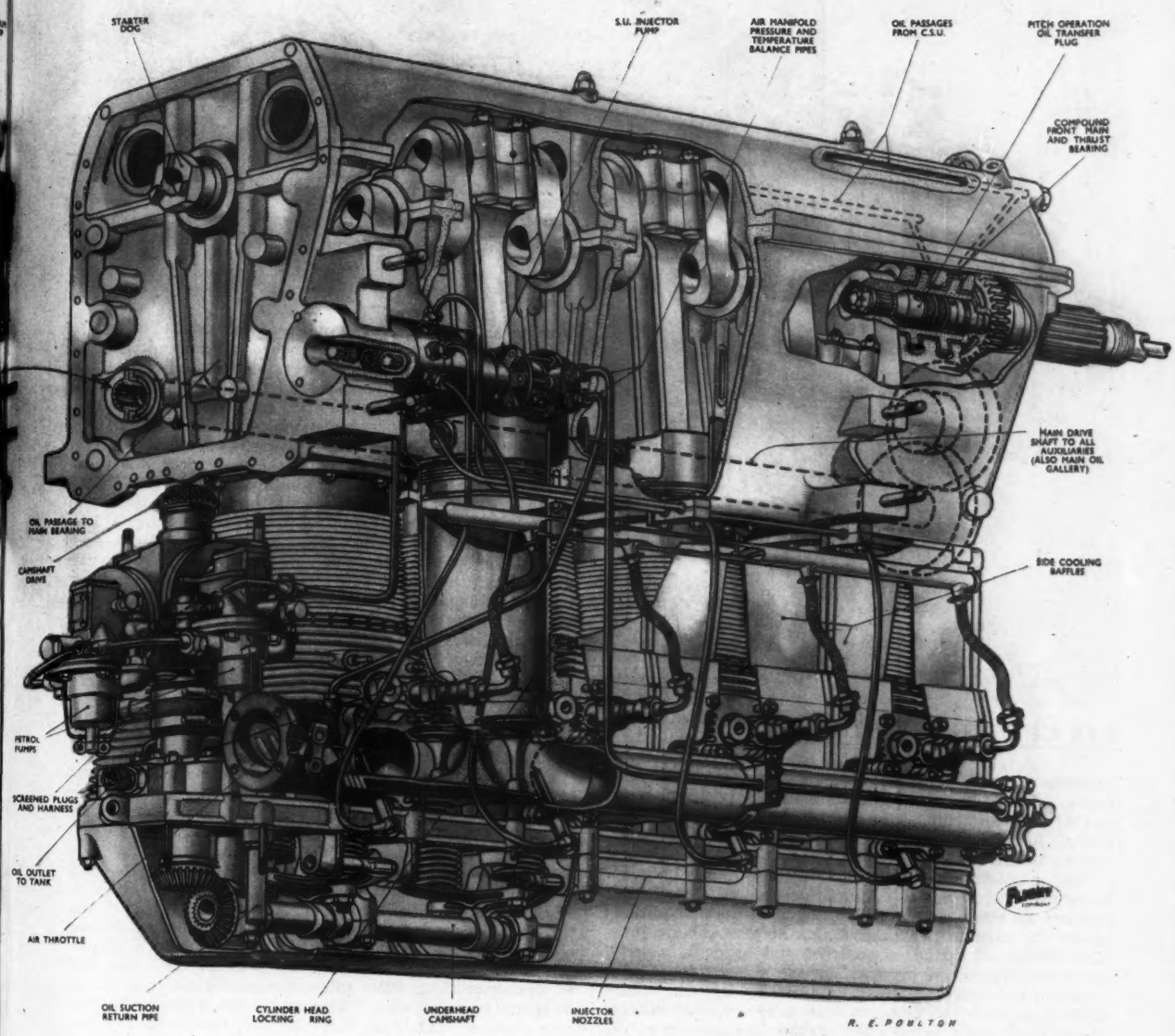


The appearance of the engine is both neat and clean. Quick-release button fasteners allow rapid removal of the inspection panels in the cooling shroud to permit of ready accessibility to the plugs and harness.



To return to the cylinder heads, the combustion chamber is of quite normal pent-dome type with the valves centrally disposed vertically in the transverse plane. The valves themselves are of normal poppet type, with their striker pads stellited, as also are the inserted seatings in the head; cast-iron and bronze inserts are employed respectively for the exhaust and inlet valve guides. Plugs are positioned in the sides of the head on a common axis set at about 30 deg across the plane of the valve axes.

To take advantage of the benefits to be obtained from direct fuel injection, the breathing characteristics of the engine must be such that mass-flow through the unit is as great as can conveniently be obtained. In relation to the combustion chamber shape and size, the valve ports could not well be larger than they are. As it is, the inlet valve port area is just over 60 per cent greater than that of the exhaust valve, and the passage between air inlet trunk and port is formed as a simple elbow conduit. By contrast, the exhaust port passage in the head is of swan-

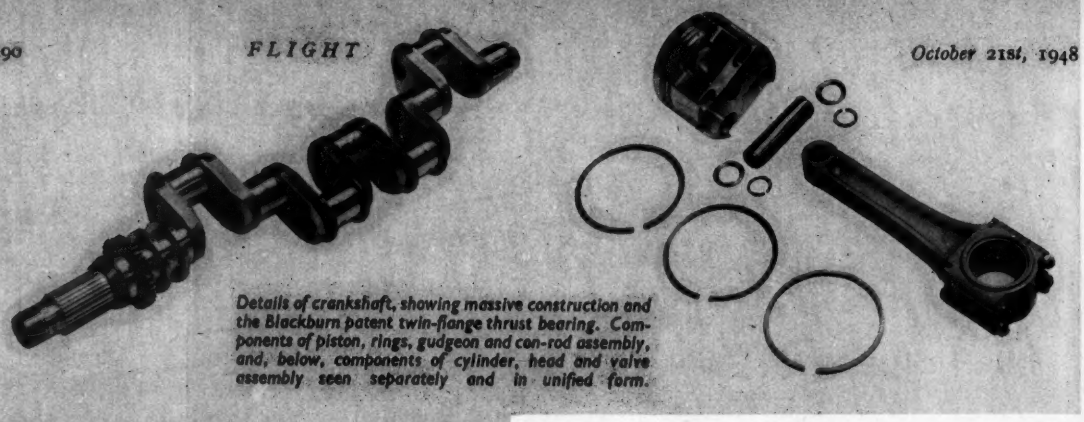


The simplicity of the engine's basic structure and the details of the direct fuel injection system are clearly evident in this excellent drawing by "Flight" artist R. E. Poulton. Noteworthy features are the unique front-main and thrust bearing, the drive shaft-cum-oil gallery, and the self-contained rear cover wheelcase carrying the auxiliaries. At left is a rear view of the engine showing the disposition of the various auxiliary components in their neat grouping.

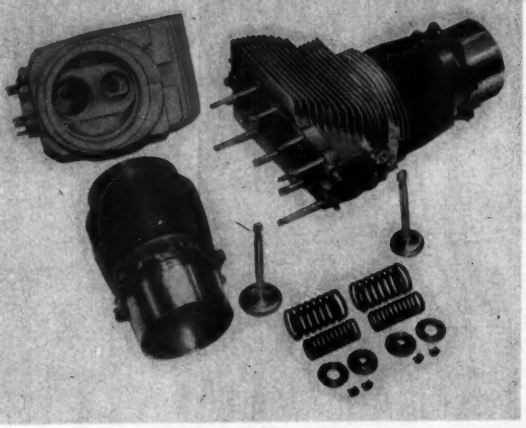
neck form although of largely constant-volume contour.

The fuel-injector nozzles are screwed into the head with steel adaptors and project into the induction port passages to direct the fuel spray on to the upstream "trumpet-back" surface of the valve. Although not specifically designed with such an end in view, the positioning of the injector nozzles is such that the belling of the valve must, in some degree, act as a diffuser face for the injected spray. The injector nozzles are S.U. components, each in the form of a hardened steel tube one end of which is tapped for connecting the fuel-feed banjo union, whilst the other end is formed as a nozzle. Normally, the nozzle orifice is closed by an arrow-section valve, held down on its seat by a coil tension spring in the bore of the nozzle tube; the valve opens to admit the injection of fuel at a pressure of 70 lb/sq in. Incidentally, it is well worthy of note that one of the requirements stipulated by the Ministry in their development contract was that the engine should be designed to run on 80 octane (M.T.) unleaded fuel. This was, of course, adhered to, but no trouble has been experienced with lead deposition when running on 87 octane with 5.5 c.c. TEL/gall., nor with 91-98 octane with 4.8 c.c. TEL/gall. content.

Whilst on the subject of induction, we might go on to consider the inlet tracting and the injection mechanism. There is no induction manifold in the commonly understood sense of the term; instead, a plain, cylindrical trunk of cast Elektron conducts air to the inlet ports in the cylinder heads, the amount of air introduced being governed by an aerofoil-section butterfly throttle at the upstream end of the tract. The injector pump is a twin-plunger, swash-plate S.U. unit from which individual feed lines are taken to each of the four injector nozzles. Immediately downstream of the throttle in the air trunk, the sectional area is slightly decreased to form a venturi throat, and from this a pipe line connects to a capsule chamber in the injector pump. A similar pipe line from this



Details of crankshaft, showing massive construction and the Blackburn patent twin-flange thrust bearing. Components of piston, rings, gudgeon and con-rod assembly, and, below, components of cylinder, head and valve assembly seen separately and in unified form.



CIRRUS BOMBARDIER . . .

chamber connects to the downstream extremity of the inlet trunk, so that the pressure differential between the up- and down-stream ends of the trunk induces a flow of induction air in the form of a by-pass return circuit through the capsule chamber.

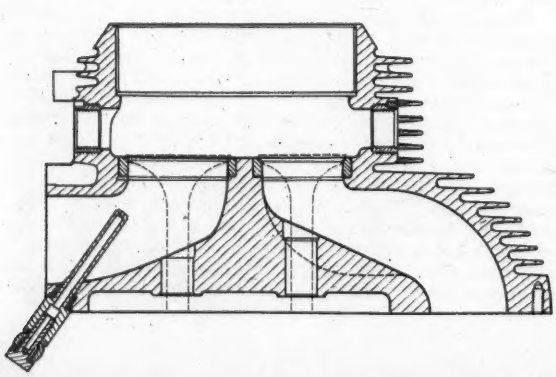
The purpose of this is to regulate the output of the injector pump according to manifold depression, altitude and ambient air temperature. The integral of these conditions causes the capsule (which is sealed at atmospheric pressure) either to expand or contract and so move a servo valve to regulate oil pressure on one side or other of a piston in the pump, in order, in turn, to vary the stroke of the plungers which pump the fuel to the injector nozzles. The injector pump is mounted on the forward side of the wheelcase at the rear of the engine and lies along the starboard side.

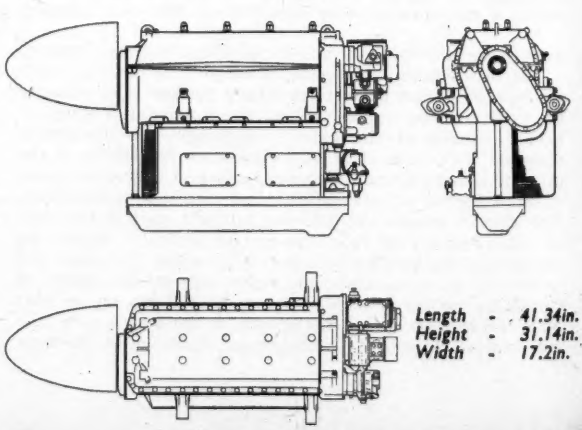
Immediately behind the airscrew rear cone (a Capasco processed-asbestos unit) on the airscrew shaft, is a Woodruff-keyed pinion which, through an idler, gives drive to a hollow shaft running back along the port side of the cylinder skirts in the base of the crankcase. This shaft is the main drive transfer to the wheelcase on and through which the various auxiliaries are mounted and driven; at the same time, the drive shaft functions as the oil gallery for supply of lubricant to the main crankshaft bearings and big ends. The main oil supply pump is driven direct from the rear end of the auxiliary drive shaft, and its output is conducted through passages in the rear cover wheelcase to the rear bearing housing of the auxiliaries' drive shaft, to the constant-speed unit and, via the latter, to the main thrust bearing. The oil supplied to the end bearing of the auxiliary shaft is fed into the interior of the shaft, and each of the split bearing shells in which the shaft runs is grooved on the outer and inner diameters with linking holes at the split joint. These bearings are housed in the crankcase webs which also carry the main crankshaft bearings, with core passages in the webs communicating between the two. Thus, under normal system pressure plus centrifuge action, the oil is conducted from the shaft interior out through the grooved bearings and so, via the core passages, to the main bearings. As already described, internal plumbing in the crankshaft distributes oil to the crankpins.

For lubrication of the compound front main and thrust bearing, oil from the supply pump is passed through the c.s.u. pump, where the pressure is boosted to a maximum of 400 lb/sq in. From here, dual core passages in the crankcase top cover conduct the oil to the front of the engine, each oil passage serving one thrust bearing trough. This oil is also the supply to the pitch-change mechanism of the airscrew. Radial holes from the peripheries of the thrust flanges down into the shaft core allow transfer of oil from the thrust bearing troughs into the distributor plug in the shaft interior, whence pressure oil is directed to the airscrew to effect pitch change. Thus, one thrust flange is supplied with "fine-pitch" oil whilst the other gets "coarse-pitch" oil, but although when the airscrew is constant-speeding the oil supply is divided rapidly and alternately first to one thrust flange, then the other, even when a large change in r.p.m. is quickly selected, the thrust flange in the "return" circuit is still supplied with oil at abundant pressure for its purpose.

As readily seen in our main drawing, the arrangement

Detail section through cylinder head showing location of injector nozzle in relation to port passages, valves and sparking plug positions.





Length - 41.34in.
Height - 31.14in.
Width - 17.2in.

BLACKBURN CIRRUS BOMBARDIER 702

Leading Particulars

Type	Air-cooled, in-line, 4-cylinder inverted
Bore and stroke	4.8in x 5.5in
Swept volume	398.12 cu in (6.524 litres)
Frontal area	3.92 sq ft
Rotation	left-hand tractor
Airscrew shaft size	No. 1 S.B.A.C.
Valve type	Poppet
Number of valves/cylinder	2, vertically disposed
Fuel Injector	S.U. twin-plunger, swash-plate pump
Magneto	B.T.H. Dual Type C.T. 4A
Plug positions	2/cylinder, diametrically opposed
Firing order	1, 3, 4, 2
Ignition timing	42 deg B.T.D.C. (advanced) both mags

Aspiration

Valve timing :
Inlet opens 27 deg B.T.D.C., closes 82 deg A.B.D.C.
Exhaust opens 69 deg B.B.D.C., closes 45½ deg A.T.D.C.

Valve spring rates :	
Inner	28.06lb/in
Outer	46.2lb/in
Inlet port area	3.462 sq in
Exhaust port area	2.138 sq in
Piston area to inlet valve area ratio	5.22 : 1
Piston area to exhaust valve area ratio	8.47 : 1
Cylinder compression ratio	7 : 1
Mean cross-sectional area of induction pipe	3.34 sq in
Mean gas speed at inlet ports	211ft/sec

Weight

Power/weight ratio	0.514 b.h.p./lb
Contract dry weight	350lb ± 5lb
Weight/sq in piston area	4.84lb
Weight of piston and rod assembly/cylinder	5.63lb

Reciprocating Units

No. of main bearings	5
Main bearing diameters	2.25in
Main bearing areas	4.5 sq in (1 journal)
Big end diameters	2in
Big end areas	4.5 sq in (1 crankpin)
Gudgeon diameter	1in
Rod/gudgeon bearing area	1.3 sq in
Piston/gudgeon bearing area	2 sq in
Con rod length, centre-to-centre	10in
Ratio of con rod length to stroke	1.82 : 1
Max angularity of con rods	15 deg 58 min
Max mean piston speed	2,385ft/min
Cam base circle diameters :	
Exhaust	1.15in
Inlet	1.10in
Valve lifts :	
Inlet	0.598in
Exhaust	0.5785in

Power

Max F.T. manifold depression	0.7in Hg
Cruising manifold depression	2.04in Hg
Rated height	1,250ft
Max b.h.p.	180
Max r.p.m.	2,600
Cruise r.p.m.	2,300
Max b.m.e.p.	143.2lb/sq in
Power/cu in swept volume	2.955 b.h.p.
Power/sq in piston area	2.49 b.h.p.
Power/sq in frontal area	0.3185 b.h.p.

Consumptions

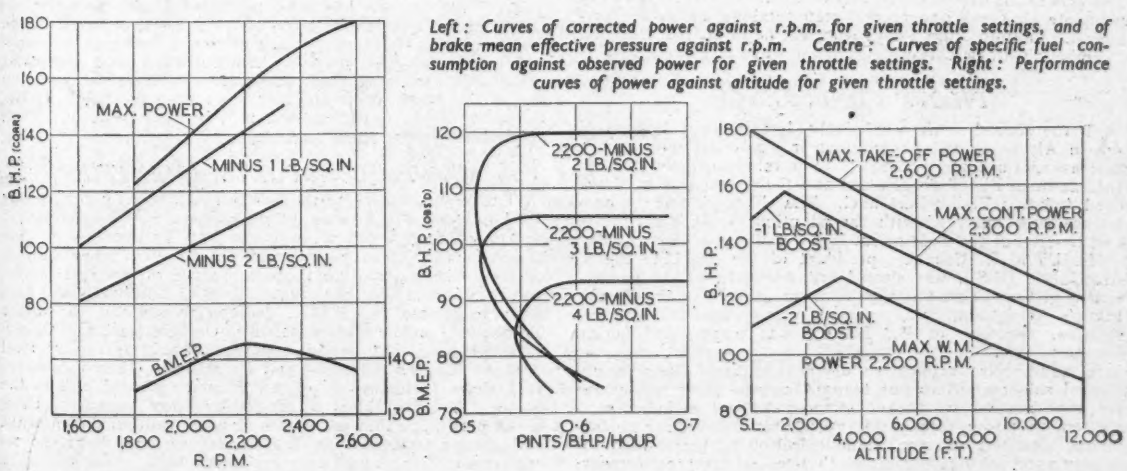
Max consumption	13.25 gall/hr at sea level
Take-off consumption	13.25 gall/hr at sea level
Climb consumption	9.65 gall/hr at sea level
Recommended economical cruise consumption	7.0 gall/hr. at 3,250ft
Max cruise consumption	9.75 gall/hr at 1,250ft

for mounting and driving the various auxiliaries at the rear of the engine is neat and ingenious. The engine rear cover is in the form of a wheelcase in which the gear trains for distributing drive from the main input pinion to the several components are self-contained. Mounted on the cover at the top are the constant-speed unit, the starter, and the integrally screened magneto which incorporates an impulse starter unit. Below these, on the starboard side, are the tachometer drive and, on the forward face of the cover, the fuel injector pump, whilst the lower row of auxiliaries is made up of the oil pump, the compressor (which is interchangeable with a hydraulic pump) and the generator. Drive to the camshaft is given by a vertical bevel shaft upon which are carried a pair of eccentrics for driving the twin Amal fuel pumps. At the base of the bevel shaft, drive is also taken off to the duplex scavenge pumps, one section of which evacuates the front of the engine, whilst the other caters for the rear, drain pipes passing oil down from the crankcase to the valve chest.

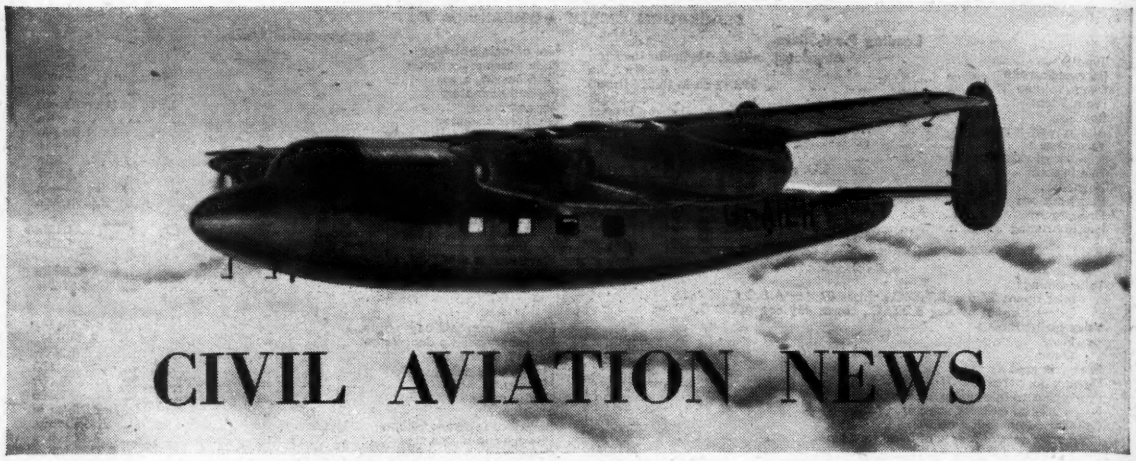
The underhead camshaft is made from S.14 steel and is carried direct in five bearing standards cast integrally with the valve carrier-plate which bridges the cylinder heads. This is anchored to each head with four short studs, together with four long studs which additionally serve to anchor the enclosing valve chest. The cams are not harmonic and, although those serving the inlet valves have a slightly greater, if a little slower, lift than those actuating the exhaust valves, both sets of cams have in common a profile designed to give a low closing velocity. Rockers are L-shaped members, running direct in bearing lugs cast in the carrier-plate, the cantilever fingers having stellited follower pads and adjustable stellited tappets. We have already referred to the valves when dealing with the cylinder heads, and there is little more to add in this context other than that each valve is opened against co-axial springs of opposite helix, the outer springs having a compression reaction of 46 lb/in, whilst the corresponding figure for the inner springs is 28 lb/in.

Reviewing the Bombardier, one must come to recognize that a good job of work has been done in the best traditions of British engineering. It is a calculated admixture of established practices which have been proven with the years, and of the latest ideas on the efficient distribution of fuel, these qualities together with detail refinements of design having produced an engine which, in its general category, is uneclipsed in power output for low weight for low specific fuel consumption. Since the Musketeer and Grenadier can be regarded as respectively unblown and blown six-cylinder versions of the Bombardier, it is, perhaps, warrantable to expect that, in their own fields of operation, they will hold as much promise as their smaller precursor.

C. B. B.-W.



Left : Curves of corrected power against r.p.m. for given throttle settings, and of brake mean effective pressure against r.p.m. Centre : Curves of specific fuel consumption against observed power for given throttle settings. Right : Performance curves of power against altitude for given throttle settings.



CIVIL AVIATION NEWS

EARMARKED: One Marathon is under final development testing and Handley Page hope that the first production aircraft will be ready by the middle of next year. The Ministry of Supply have ordered 40 Marathons, of which about 10 are earmarked for B.E.A. and others for B.O.A.C. sponsored routes. Development work on a version powered by propjets will continue and one will be flying in due course.

T.A.A. Loses Money : International Pilots Meet : Developments for Scottish Airports

B.E.A. WINTER SCHEDULES

MORE frequent services on many of the main continental routes than were in operation last winter are provided by B.E.A.'s winter schedules which commence October 31st. The London-Paris service will fly four times a day during the week, with two flights on Sundays. A twice-daily weekday service between London and Brussels with one on Sundays is scheduled, also daily services to Stockholm, Athens and Copenhagen (en route for Stockholm). The Cyprus service, introduced December, 1947, will provide three flights a week operating in conjunction with Cyprus Airways linking up with the B.E.A. Rome-Athens route. Two new services, not in operation last winter, are the London-Malta (via Marseilles and Rome), which will maintain the present frequency of twice a week, and the London-Zurich, which will be increased from one to two services daily as from December 17th, in order to cope with winter sports visitors. Internal winter schedules are not yet finalized.

B.O.A.C. IN AIR LIFT

DAKOTAS which have recently been withdrawn from the British Overseas Airways Corporation's Cairo service have joined the Berlin air lift. The Corporation have, as originally planned, replaced those aircraft with Avro Yorks. Seven Dakotas in all will be based at Fuhlesbuttel, with twenty-five complete air crews and ground staff totalling eighty-five personnel. Captain Nigel Pelly, who will be in charge, flew Mr. Chamberlain to Berchtesgaden ten years ago last month.

PILOTS' CONFERENCE

AT the second conference of the International Federation of Airline Pilots' Associations in Paris last month, two new associations were admitted to membership: the K.L.M. International Pilots' Association and the Association of Greek Civil Aviation Flying Personnel. The chief work of the conference was concerned with the adoption of the constitution and by-laws of the Federation.

Mr. David L. Behncke, president of the Air Line Pilots' Association (U.S.), was elected first president of the Federation, and Capt. Max Castello, secretary-general of the French Pilots' Association, was elected vice-president. Mr. D. Follows, secretary of B.A.L.P.A., was reappointed acting secretary.

In addition to ratification of previous resolutions, newly formed sub-committees put forward certain other resolutions for consideration by the conference. These included such matters as power sources for gyroscopic blind-flying instruments, altimeter settings, standardization of units, high intensity approach lighting, air worthiness, and crew complement.

LONDON AIRPORT BALL

SIR JOHN and Lady D'Albiac received guests at an International Ball at London Airport on Friday, October 15th. The entire Departure Section of the Passenger Handling Block was handed over for the purposes of the Ball and departing passengers from 1400 hrs that day were routed through one side of the Arrivals Block. The Ball Room was actually the new Departure Lounge which has been open only a month and which will eventually be a combined lounge for departing and arriving passengers. About 500 guests enjoyed the evening which was organized by London Airport authorities including Health, Customs and M.C.A. interests and the operating companies, under the chairmanship of Mr. Roger C. Pugh. Amongst those present were Lord and Lady Pakenham, Mr. and Mrs. G. S. Lindgren, Mr. Whitney Straight and Lady Daphne Straight and many others connected with international aviation.

M.C.A. APPOINTMENTS

MR. J. E. KEEL has been promoted Under Secretary in charge of the new Safety and General Department of the Ministry of Civil Aviation. He was Deputy Director General (Storage and Breakdown) of M.A.P. before being transferred to the M.C.A. in February, 1946. He has been Director of Finance (Ground) and in December, 1946, became Establishment Officer (B).

Mr. C. W. Evans has been promoted Under Secretary in charge of the Finance Department. He was transferred to the Air Ministry in 1938 and on being promoted Assistant Secretary in June, 1943, he became Administrative and Financial Adviser in Transport Command. He was transferred to the M.C.A. in April, 1945, and has since been in charge of the European and South American Airways Division. Both appointments took effect on October 18th.

SCOTTISH AIRPORTS AMENITIES

AT a recent meeting of the Scottish Advisory Council it was unanimously decided to recommend the installation of additional flying control equipment at Turnhouse. At the same time the Council did not admit that such improvements in control were essential to the continuance of winter services, and it is understood that organizations in Edinburgh will continue to oppose the B.E.A. decision to suspend the direct Turnhouse-London service between October 31st and March 1st. During that period passengers would travel by road between Renfrew (Glasgow) and Edinburgh. It is understood that since Turnhouse is an Air Ministry airfield and is the home of No. 600 Royal Auxiliary Air Force Squadron, there is the possibility that extensions may be made to the runways and greater facilities may be provided as a result of the re-equipment of the squadron with jet aircraft. That is only a

possibility, however, and there is strong feeling in Scotland against the decision, especially as B.E.A. have been flying to capacity since fares were reduced.

Sir Patrick Dollan recently stated that there would be an increase in staff at Renfrew in March or April next year when that airfield became the maintenance base for B.E.A. Dakotas and Rapides. Accommodation would also be improved for passengers, and there were plans for a new terminal building and a new entrance on the main Glasgow road, which would save about eight minutes in the time taken by surface transport from the city. B.E.A. have applied for permission to provide catering at all Scottish airports on their routes.

BREVITIES

IT is understood from Malta that shareholders of Malta Airways have approved the admission of B.E.A. capital and of two nominated directors. Malta Airways are taking over some services which were formerly run by B.O.A.C.

* * *

At the annual general meeting of the Institute of Navigation, the following were elected to replace retiring members of the council: Mr. Francis Chichester; Rear Admiral Wyatt, hydrographer to the Navy; Captain Quick, chief examiner of Masters and Mates, and Professor Hart, Professor of Survey, University of London.

* * *

B.O.A.C. flying-boats operating services to South Africa, Pakistan, India, Australia and the Far East will, as from October 24th, use the new marine airport on Lake Mariut, Alexandria, instead of Cairo. Landplane services to and through the Middle East will continue to use Almaza airfield at Cairo.

* * *

Weston Airways and Cambrian Airways, whose agreements, jointly with B.E.A., to operate the Cardiff/Weston-super-Mare service were due to expire on October 11th, have been granted a twelve months' extension. An extension until December 31st, 1948, has been granted to Air Enterprises, whose operation of the Croydon/Cowes service was due to end on October 31st, and Lancashire Aircraft Corporation's agreement in respect of the Blackpool/Southport service, due to end on September 30th, has been extended to October 31st.

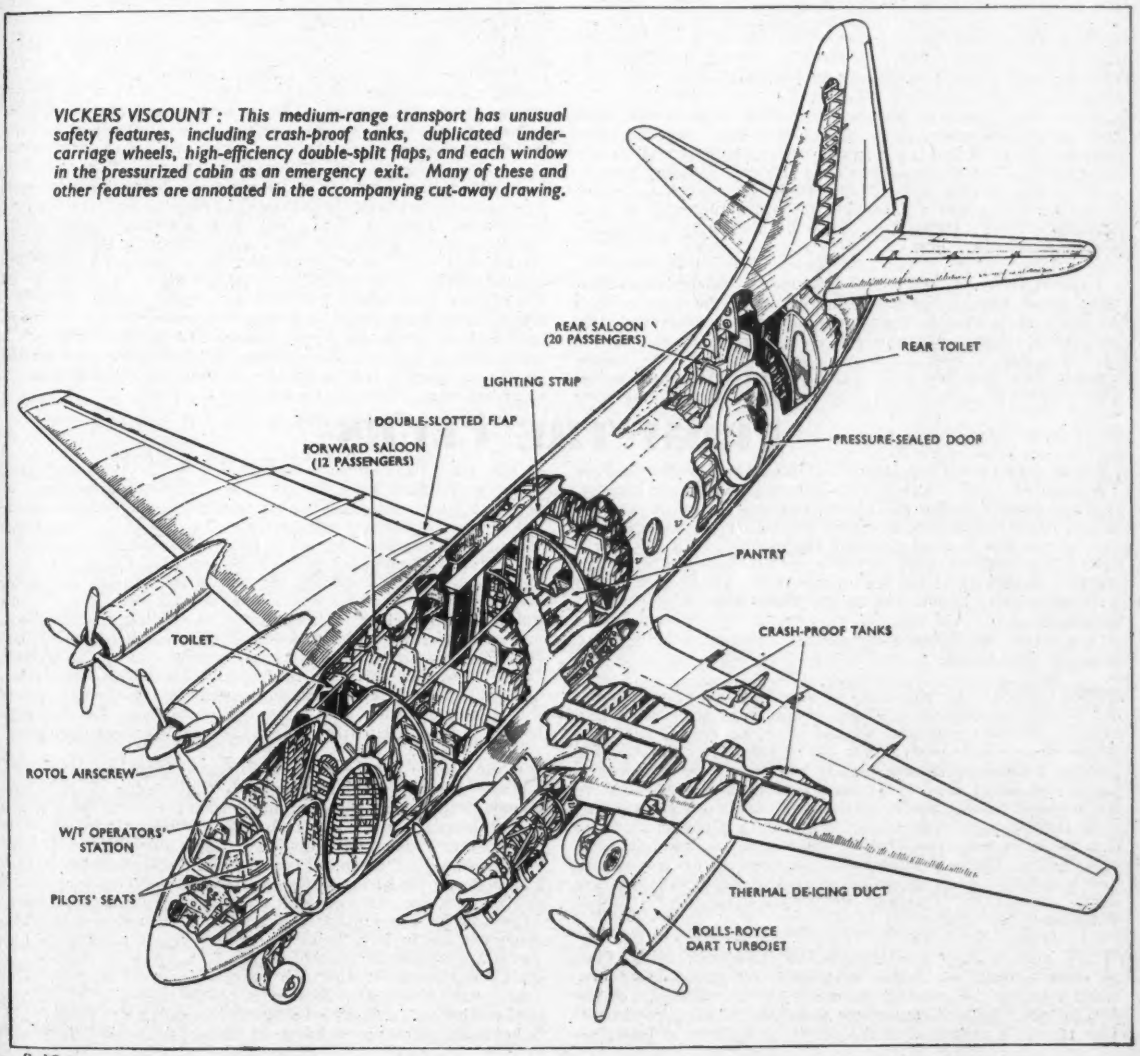
* * *

A proving flight, in preparation for a new service to the West Indies, which Air France expect to put on a permanent and regular basis without delay, is shortly to be made by way of Shannon, Gander, Bermuda and San Juan (Porto Rico). At San Juan, connection will be made with the company's Catalina flying-boat service to Caracas, Trinidad and other points in the West Indies and on the South American mainland. Constellations will be used.

* * *

It is reported from North Atlantic operators that the recently instituted excursion fares have had the effect of extending the season for North Atlantic traffic. Eastbound traffic normally slackens about this time of the year, but advanced reservations show that it will be at a peak for some

VICKERS VISCOUNT: This medium-range transport has unusual safety features, including crash-proof tanks, duplicated undercarriage wheels, high-efficiency double-split flaps, and each window in the pressurized cabin as an emergency exit. Many of these and other features are annotated in the accompanying cut-away drawing.



Civil Aviation News . . . . .

weeks to come. On the first day of the plan, A.O.A. sold 35 excursion tickets in London, Prestwick and Shannon. B.O.A.C. has reported a "highly gratifying" response.

* * *

Heston has been closed for all flying, and in no circumstances will permission be given for landing at that airfield owing to obstructions which have made it dangerous to aircraft.

* * *

Hong Kong Airways, an associate of B.O.A.C., have recently completed the 1,000th round trip between Hong Kong and Canton. They began operating international routes in the Far East in December, 1947.

* * *

Passengers carried on Australian internal air lines for the year ended June, 1948, numbered 1,217,178. A.N.A. carried 584,170 and T.A.A. 343,811 passengers. The amount of freight carried during the year was 26,036 tons.

* * *

The air ferry for motor vehicles between Folkestone and Le Touquet, operated by Silver City Airways, Ltd., has now ceased operation for the season. This service, which was sponsored by the A.A. and R.A.C., has been operating on an experimental basis for ten weeks, and during that time has carried 174 motor cars.

* * *

On selected runways at certain airfields in the U.K. a new type of approach lighting has been installed. A single straight line of sodium lights on the centre line of the runway extends for a distance of 4,500ft from the threshold of the runway, with lights spaced 300ft apart. Two runways at Northolt and one at Nutts Corner, Belfast, have been completed so far, and additional installations are in hand.

* * *

From May 1st to September 30th this year, Aer Lingus carried 104,276 passengers. The Dublin-London route was operated at 12 round-trip services a day, and carried 44,990 passengers. The Shannon-London route carried 3,207 passengers on one service a day. The passenger figures for other routes were as follows: Liverpool 18,797; Manchester 13,956; Glasgow 12,054; Paris 2,049; Isle of Man 3,671; Shannon 3,266; Amsterdam 484.

* * *

Captain C. W. J. Allen has registered a new charter company, Allen Aircraft Services, Limited, with offices at Croydon Airport. More than 20 years ago Captain Allen surveyed sites and made recommendations for the development of airfields in South Africa with an Avro "504" aircraft. He subsequently flew Handley Page 42s on the London-Paris route, and Empire flying-boats for Imperial Airways. A long spell of charter flying with Air Taxis ended with the outbreak of war in 1939.

* * *

During operations in 1947 the State-controlled East African Airways Corporation incurred a loss of £20,000. In reporting the loss the general manager blamed what he termed the ridiculously low standard of communications and said that a telegram took longer than the aircraft to which it referred.

* * *

Work on the new airport at Ezeiza, near Buenos Aires, is nearly completed and, provisionally, it will be in operation at the end of the year. Covering 18,600 acres, it is claimed to be the third largest international airport in the world.

* * *

It is understood that an official delegation from the Netherlands Government is shortly going to Australia to make final arrangements for reopening, with Constellations, a K.L.M. service to Sydney.

* * *

S.A.S.-A.B.A. airlines, in collaboration with the Finnish Aero Co., opened a new service from Stockholm to Åbo (Turko), Finland, on October 4th. Services are run on all weekdays, and from Abo there are air connections to the Finnish towns of Vasa, Tammerfors, Kemi and Björneborg.

* * *

Regular services from Amsterdam to Hong Kong via Rome, Geneva, Cairo, Shahjah, Bombay, Calcutta and Bangkok, are being flown by Skymasters owned by the Norwegian shipping company Ludwig Braathens. Fares for through bookings are: London to Bombay, £129; London to Calcutta, £142; London to Bangkok, £158; and London to Hong Kong, £170.

* * *

An increase from 13,036,748 passenger miles in the first six months of 1947 to 19,473,492 during the corresponding period this year is announced by the West Indies Division of K.L.M. The number of passengers carried increased from 32,111 to 46,286; freight from 859,828 lb to 1,304,627 lb; and mail from 77,526 lb to 112,684 lb. The present length of the K.L.M. routes in the West Indies is 6,200 miles, linking 16 of the principal cities in the area.

* * *

At the end of October and during the following six weeks representatives of British Aviation Services and its trading subsidiary, Britavia, Ltd., will tour Europe, Egypt, East Africa, Central Africa and the Union, returning through West Africa and the Iberian Peninsular in a Lockheed Lodestar. The aircraft will be specially fitted to carry a wide range of engineering and allied products for export, some of which weigh more than 500 lb. A stay of two weeks will be made in Rhodesia where the sponsoring companies have their own subsidiary in Lusaka. It was originally intended to take one of the company's Bristol Freighters, but those particular aircraft are busily engaged on the Berlin air lift.

FROM THE CLUBS

AT the Herts and Essex Aero Club during the two weeks from October 17th onwards, the Club championships, consisting of exercises in general flying, aerobatics, cross countries, forced and precautionary landings, will be held, and on November 7th, at the conclusion of the championships, a dance will take place. The annual ball of the Club has been arranged for December 15th at the Park Lane Hotel, and it is expected that the price of tickets will be the same as last year, i.e., two guineas each.

A total of 420 hours was flown at Broxbourne during the month of September.

* * *

FOLLOWING the launching of the Thames Valley Flying Group, announced in *Flight*, September 30th, at White Waltham airfield it is now learned that this organization has joined forces with the Community Flying Club at Woodley airfield, Reading, who have already had experience with operating on communal lines. This amalgamation has helped to solve the problem of whether to have single- or two-seater aircraft since the Community Club had both a Moth Minor and a Piper Cub two-seaters and the Thames Valley group will add a single-seat Chilton. The new organization has been offered free hangar and clubhouse accommodation and this hospitable gesture easily offsets the travelling to Woodley instead of White Waltham.

* * *

THE annual general meeting of the Lancashire Aero Club was held on September 21st, and was immediately preceded by a special general meeting. At the conclusion of the A.G.M. the Parnall Trophy was presented to Mr. Woodward. This trophy is presented to the person, chosen by at least two of the previous holders, who has during the preceding year done outstanding work for the Club. Numerous members of the Club have during September been using aircraft for extensive flying for business purposes.

The Club regrets that its appeal published in August for lecturers on various subjects connected with flying, has met with disappointing response. It renews this appeal, therefore, and hopes that members who can do so will come forward and volunteer instruction on elementary navigation, meteorology, engines, airframes and airmanship. The competitions for the Rodman, Leeming and Pemberton trophies were to be held on October 16th, commencing at 2 p.m. The Rodman and Pemberton trophies are for landings performed by senior pilots (over 50 hours solo) and juniors respectively. The Leeming trophy is awarded to the winner of a navigational exercise.

* * *

SOME twenty members of the Yorkshire Aeroplane club participated in the club's rally to the Tudor Close Hotel, Rottingdean, near Brighton, on September 10th-12th, which was a great success. The club also provided the aircraft for joy-rides on Battle of Britain Day, September 18th, at Church Fenton R.A.F. Station. Recently Mr. F. H. Sturdy, a club member, completed his first solo after only 3 hours 50 minutes' dual instruction, having had no previous flying experience. From October 1st until March 31st next the reduced membership rates are in force being £3 3s for flying membership, and £2 2s for non-flying membership. A number of Auster aircraft are for sale at the club varying in price from £450 to £1,275, and these may be seen at Sherburn-in-Elmet. Admission to the club's Bonfire Party on November 5th is to be by ticket only, price 10s inclusive of dinner, fireworks, etc.

Casual Commentary

What of the Next Generation of Transport Pilots? : The Closing of Aldermaston : Why Not a Government-sponsored Training Scheme?

By ROBERT CARLING

SURPRISINGLY little fuss seems to have been made about the closing of Airways Training at Aldermaston. No doubt it was politically inexpedient for the Corporation or the Ministries to say very much at the time of the announcement, and wheels appear to have been revolving within wheels for some little time. Nobody outside—and probably very few people inside—could give an accurate and quite unbiased account of the reasons for the establishment of the organization in the first place on such a magnificent and expensive scale, or, so relatively soon afterwards, for the sudden removal of support by one of the Corporations. Then, to muddle the entire issue still further, there was the unhappy appearance of this subsidized, virtually State-supported training centre competing, in outside appearance at least, with private enterprise.

I don't profess to know anything about the politics of the affair, but certain things are obvious to anyone. First of all, we are going to need, and need very badly, just such an airline training centre within the next five years. How else are the gaps among transport pilots, caused by retirement, to be satisfactorily filled by the right sort of people?

Secondly, those who planned the centre must have had their eyes wide open to the requirements and costs of such training facilities, and must surely have known what they were doing when they agreed to pay, for instance, the six-figure rent asked for the airfield and buildings. Flying staff requirements could hardly have changed so much in a matter of twelve months that the whole thing was to be considered the grandest possible investment at one moment and the most insane extravagance the next.

Thirdly, the unfair competition argument doesn't really hold water because the kind of training to be provided at Aldermaston could not possibly have been paid for by privately financed trainees—or even, for that matter, provided by private enterprise—unless a clear-cut contract, covering a period of years, could have been agreed.

Airlines Prefer Own Training

The idea offered for public consumption towards the end of the life of the establishment—that Dominion, colonial and foreign airline operators might find such a training centre useful—was surely a little naïve. Admittedly there was, at least in the earlier years, no difficulty in finding oversea customers for the Empire Test Pilots' School, even at a very high fee, but the situation there was rather different in that it was the only school of its kind in the world, and certainly the only one where modern jet fighters and heavy bombers could be flown. The average large airline operating company, with its own fleet of aircraft, would prefer to do its own general and instrument training, using the type of aircraft which the trainees would eventually fly. Maybe, if it had been possible for Airways Training to offer complete training facilities in all modern aircraft types from Constellations and DC-6s downwards, there might have been a rush of custom, but heaven knows what the fees would have needed to be to cover the costs.

Nevertheless, there *is* the need for an airline training centre, and the need will become more and more obvious as the years go by. Re-launched on a less gargantuan scale, such a centre would surely be less extravagant, even for Corporation training alone, than the separate affairs which are at present in operation at Hurn and, I believe, at Cranfield. Given centralization and a pooling of instructional resources its operation should be less expensive than the individual schools and it could be used for a number of other purposes. I cannot see that the training requirements of the three Corporations are so very unlike each other that such centralization would be impracticable—any more than I can see that project, development and long-range planning should require separate huddles by boffins in four or five different places. No doubt B.O.A.C., B.E.A., Ministry of Supply and Ministry of Civil Aviation planners and researchers get together from time to time and tell each other on the telephone about their different ideas, but for all we know they may well be making individual efforts towards the same ends.

Cost and Common Sense

Not that centralization is necessarily a virtue. We have already found to our cost that it must be qualified with common sense. Small units may sometimes be wasteful, but their very smallness ensures that all the relatively few people involved in each case feel that they are part of the total effort and will consequently give of their best. So often in large organizations bright little lights are hidden for ever beneath the bushel of jealousy, and underneath the total weight of the bureaucratic pyramid. When young Smith's good idea has to pass upwards through the filing trays of various higher grades before it reaches the desk of the Director of This and That there is far too ample an opportunity for the goodness to evaporate, while the frustrated Smith, unless he is of heroic stuff, becomes a mere backroom clock watcher. In the case of a training establishment centralization might need to apply only to the premises and the equipment.

Of course, the most obvious solution to the major problem of pilot-supply would be for the Ministry of Civil Aviation (perhaps) to operate a school—sub-contracting the training as deemed expedient—partly or wholly at the public expense and as a public service. With scholarships and all the rest of it this school, or series of schools, would take pupils who elected to make airline or charter flying their career. After a two-year or three-year course the embryo captains would be turned out fit to fly anything anywhere, and the airline companies would then make their own arrangements for specialized or line training just as they do now.

There might, no doubt, be criticism from the Air Council, who would not like to see their Service flying "material" being diverted in this way. But the civil pilots would not necessarily be lost as prospective war pilots and it might even be practicable to come to an arrangement whereby a proportion of the time of training would be spent at Service establishments, and each pupil, thereafter, placed on the reserve. Certainly, I have always felt that a few years in the R.A.F. does not necessarily make an ideal airline captain and that it was absurd to depend on the Service for the supply of reasonably experienced pilots.

There would also be a number of incidental advantages to such a scheme. For instance, the Ministry of Civil Aviation might use the available facilities for instrument-rating and licensing checks, thus, at one blow, providing something more suitable for the purpose than the rather absurdly limited M.C.A. fleet of the present, and keeping the new generation of pilots abreast of all actual and possibly-to-be developed requirements.

One can clearly foresee at least a dozen ways in which the knitting together of theoretical, practical day-to-day, and initial training experience would be similarly valuable.

Some Economic Factors in Civil Aviation*

Comparative Transport Possibilities : The Prospect for Helicopters : Performance Comparisons of Hypothetical Aircraft with Various Power Plants

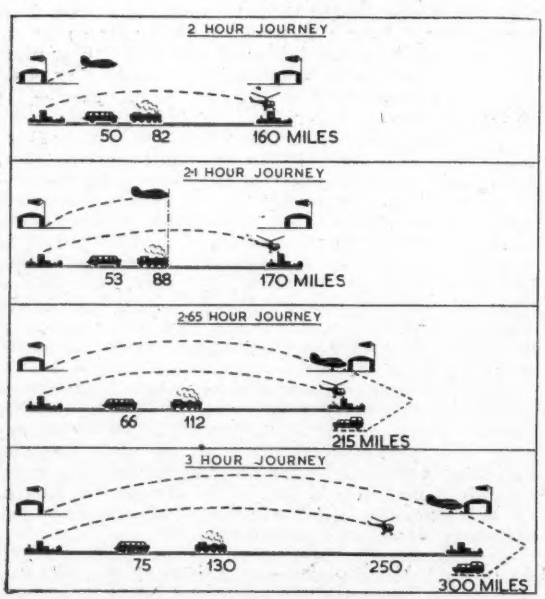
As something of a diversion, but nevertheless with a close connection to his cost analysis, Mr. Masefield next examined the question of average incomes, the value of a working hour, and from those calculated the price which should be paid for time saving in travel. It seemed that there were about 660,000 wage earners whose average earnings per working hour were just over 20s. Therefore, if the average man of this number could save an hour by flying, it was worth at least £1 to him. Moreover, the advantage of the helicopter in achieving a high block speed over a short range was worth £1 higher fare per hour saved. Some amusing diagrams were offered to illustrate the journey times for various means of transport.

A series of curves had also been plotted, from which it appeared that up to 215 miles the helicopter was the fastest means of transport; thereafter the fixed-wing aircraft was superior. For a journey of 25 miles the helicopter saved 24 minutes over the bus and cost 13s 5d more (five times the bus fare). Even so, the helicopter was likely to lose money. The helicopter's saving in time over the bus cost £1 13s 7d per hour saved. On the assumptions made, the helicopter was not worth operating in competition with a good bus service for so short a distance as 25 miles. Its saving in time in comparison with the train was insignificant—7 minutes—and the cost of saving it was very great, a rate of £3 8s per hour saved. Therefore, one might conclude that the helicopter could not compete on the fares quoted for a 25-mile inter-city journey.

If one assumed that an hour saved was worth £1, then the helicopter came into its own compared with the bus for distances of more than 100 miles. At 100 miles, for instance, the helicopter saved 2.6 hours and cost £2 6s more than the bus for the journey. A depressing fact was that compared with the train the helicopter never cost less than an extra £1 9s for an hour saved—and that at the 215 miles distance at which the fixed-wing aircraft began to take over.

Fares of less than 18d per passenger mile were too low to achieve without loss with the helicopter in its likely state of development in the next few years. Although the helicopter was both faster and cheaper per hour than was the fixed-wing aircraft for distances up to 200 miles, the comparison was merely one between losers over such distances. The answer to the question "what can be done to bridge the gap between competitive fares and operating costs for distances up to 200 miles?" was, Mr. Masefield suggested, through mail. A fast and frequent mail service between city centres would justify a relatively high but not uneconomical mail rate. A network of inter-city helicopter services in the United Kingdom providing much faster postal deliveries than could any other means of transport up to 200 miles would, Mr. Masefield submitted, be well worth the rather high mail rates of the order of 20s per ton-mile which would be necessary to prevent losses on a passenger fare of 6d per mile. The conclusion was that the helicopter could be useful up to 200 miles if air mail aid were enlisted. Thereafter, the fixed-wing aircraft took over, the turboprop offering the best economic prospects of all when developments in air traffic control came forward. The jet was faster, but even at advanced standards was slightly more expensive per mile. Both would be able to offer competitive service at speeds and rates which would outclass rival means of transport once the problems of diversion and stack-up had been solved.

An interesting sidelight on these conclusions was that the average passenger journey on British internal airlines was 150 miles—within the helicopter field—whereas the average passenger journey on British Continental services was just under 500 miles—well into the fixed-wing field and close to the most economical stage length of the Ambassador.



Some journey times for various means of transport.

Long-Range Transport

Mr. Masefield next turned his attention to an analysis of a hypothetical long-range Commonwealth and Empire Orion aircraft, the four versions of which differed chiefly in the type of power unit fitted. It was assumed, however, that some liberties had been taken with the airframe of the pure-jet Orion to improve its high-speed qualities, and also the passenger comfort when encountering gusts or turbulence at high speeds. The wings and tail surfaces were assumed to be swept, and their thickness-chord ratio reduced. There remained the problem of where to find storage space for all the fuel required, and external wing-tip tanks might be necessary. The four versions analysed were as follows:—

(1) Orion I. Four 500 b.h.p. Orion Major standard piston engines.
(2) Orion II. Four 5,750 b.h.p. Orion Maximus compound piston engines.
(3) Orion III. Four 5,750 e.h.p. turboprop engines.
(4) Orion IV. Eight 7,500 lb static thrust plain jet engines.

Eight engines in the case of the Orion IV provided a total thrust available for take-off equal to that produced for the other variants. Eight units had been chosen because of the benefits to be gained by operating on a smaller number of engines during descent, diversions to alternate airport and during stand-off. Cruising at a high output from less than the full number of engines was a far more economical method of cruise control than throttling a smaller number of engines of equivalent total power. A weight analysis and comparative performance data for the long-range Orions are given in tabular form on the next page.

The lecturer had already pointed out that turbine-powered aircraft could come into their own only as a result of improvement in air traffic control.

Assuming present operating standards for all except the Orion IV, and applying specialized but practical operating

**This instalment concludes our summary of Mr. Peter Masefield's 1948 British Commonwealth and Empire Lecture to the Royal Aeronautical Society. Some of the more technical aspects merit a closer study, and we hope to return to them at a future date.*

Some Economic Factors in Civil Aviation . . . . .

techniques to the Orion III and IV, the comparative figures shown in table, p. 498, were reached. From this it was seen that, in the assumed conditions, with 5,000 lb of payload the Orion II offered the longest still-air stage length, powered with compound piston engines. But using a "turbine technique" the Orion III ran it close and had only five per cent less range at twenty per cent greater speed. Against a 90 m.p.h. wind this extra speed would give the Orion III a longer range than the Orion II. The Orion I at the lower gross weight had 72.5 per cent of the range of the Orion II at approximately the same speed.

The jet Orion IV had almost the same range as the Orion I in still-air (73.5 per cent of the Orion II) at 66 per cent greater speed—assuming diversion and stand-off at operating height. Were standard reserves included for the Orion IV its maximum still-air stage length would be halved.

These figures meant that on, for instance, the London-New York route, leaving aside the question of economic payloads, whereas the Orion I could maintain a very high regularity westbound with one stop, the Orion II could achieve a non-stop regularity of some 99 per cent even in the worst season; the Orion III with turboprops and a westbound regularity non-stop of about 90 per cent in the worst season; the jet Orion IV, like the Orion I, would have to make one stop westbound even with the lenient standards assumed for it. In other words, the compound-piston engine made possible the longest range operations, but the turboprop could be brought fairly close to it by taking advantage of every operating device to increase range. On present standards the all-jet transport would be severely handicapped by the necessary allowances and reserves—to such an extent that its range would be considerably less than the version with standard piston engines; and it could not fly across the Atlantic commercially. When reserves could be cut by improved control methods then the range of the all-jet aircraft could be brought up to that of equivalent piston-engine types of to-day, at a very much higher speed.

Long-stage Economics

Attention was next turned from performance to long-stage economics, and fixed and operating costs for the four types were summarized as shown in the accompanying tables.

Operating possibilities were examined in relation to the most difficult yet the most profitable route in the world—the North Atlantic. Assuming that the Orions were representative of four possible lines of development in the next generation of aircraft for North Atlantic services, and that they were types such as could be in service in the years which we might hope would come to be known as the flying '50s, then the scale of likely charges for this most highly competitive of all routes might be set down as follows: passenger rate 4.5d per mile (less 10 per cent on return tickets); mail rate 3.5 gold francs per tonne-kilometre; freight rate 2.5 shillings per ton-mile. Matching the revenue and the costs in the various aircraft, and remembering always that the Orion IV was assessed on operating standards which were not yet practicable, the results were as shown in the table on page 498.

Of the aircraft operating on contemporary standards the Orion III with turboprops was much the best; although if the compound piston Orion II were flown at a greater height it would come out on the right side, financially, though it could not maintain such fast schedules as the turboprop version. The compound piston type was very much superior to the standard piston version for long-range operations. Should the large turboprop, with its still greater possibilities, take longer to come into commercial service than we hoped it might, then the compound piston engine—receiving so much attention in the United States—would be able to drive conventional engines off competitive long-stage routes.

Turbine Advantages

These results, gained objectively, were certainly encouraging. Hedged about, as they must be, by numerous arbitrary assumptions, they nevertheless gave support to those who had placed their faith in the turboprop. They were equally encouraging for those who hoped great things from eliminating the airscrew and depending on the plain jet The high revenue-earning potential of the plain jet, combined with its ability to make fast passages even against strong headwinds (the Orion IV would save about two hours on each westbound crossing, compared with the Orion III, despite one extra stop), would have very great competitive attractions *once air traffic control had advanced sufficiently to make such operations possible.* On present standards the Orion IV could not fly from Shannon to Gander with sufficient regularity and payload to justify itself commercially. Conversely, were the other Orions operated on the same advanced standards as have been assumed for the Orion IV, they would show much enhanced financial results. The Orion III, for instance, would be able to make non-stop westbound crossings with booking payloads near capacity. The saving in time as a result of cutting out stops would bring the elapsed journey time of the Orion III to within a few minutes of that of the Orion IV, with the added advantage of non-stop services.

One should not forget that flight refuelling holds out possibilities of extending range without the delays inevitable as

WEIGHT ANALYSIS ORION LONG-RANGE AIRCRAFT

Weights in lb.	Orion I (four standard piston engines)	Orion II (four compound piston engines)	Orion III (four Turboprop engines)	Orion IV (eight Turbojet engines)
Structure	54,000	55,400	57,000	59,000
Power plant and system	36,700	40,300	33,000	31,500
Operating equipment	8,100	8,100	8,100	8,100
Passenger equipment	10,600	10,600	10,600	10,600
Empty	109,400	114,400	108,700	109,200
Crew	1,750	1,750	1,750	1,750
Fixed stores	5,500	5,500	5,500	5,500
Unusable fuel	1,450	1,450	2,000	3,000
Basic	118,100	123,100	117,950	119,450
Maximum oil capacity	3,500	4,200	1,300	950
Equipped	121,600	127,300	119,250	120,400
Maximum usable fuel capacity	73,880	82,180	90,250	89,220
Corresponding payload	5,000	5,000	5,000	5,000
Usable fuel with capacity payload	53,880	62,180	70,250	69,220
Capacity payload	25,000	25,000	25,000	25,000
Disposable load	78,880	87,180	95,250	94,220
Gross	200,480	214,480	214,500	214,620
Pre-flight fuel allowances	480	480	500	620
Maximum take-off	200,000	214,000	214,000	214,000
Maximum landing	170,000	177,000	177,000	177,000

COMPARATIVE PERFORMANCE DATA ORION LONG-RANGE AIRCRAFT

	Units	Orion I (four standard piston engines)	Orion II (four compound piston engines)	Orion III (four Turbo-prop engines)	Orion IV (eight Turbo-jet engines)
1. Total take-off power	e.h.p.	20,000	23,000	23,000	(60,000lb) 23,000
2. Meto power	e.h.p.	16,800	19,300	20,200	variable
3. Cruise power assumed	e.h.p.	10,000	10,000	11,300	variable
4. Percentage of meto power for cruise	per cent	59.5	51.8	56.0	variable
5. Cruising height region—operating height at start of cruise regime	feet	20,000	20,000	30,000	40,000
6. Cruising height region—operating height at end of cruise regime	feet	20,000	20,000	40,000	51,000
7. Assumed average cruising fuel consumption	lb./hr.	4,680	3,900	6,600	8,850
8. Assumed specific cruising fuel consumption	lb./e.h.p./hr.	0.468	0.390	0.584	variable
9. Cruising speed at take-off weight	m.p.h.	305	300	370	540
10. Cruising speed at 85 per cent. take-off weight	m.p.h.	323	311	392	550
11. Cruising speed at 70 per cent. take-off weight	hr.	339	322	402	552
12. Mean cruising consumption	lb./mile	15.17	12.75	13.07	14.39
13. Mean air miles per gallon	a.m.p.g.	0.476	0.565	0.620	0.564
14. Theoretical still-air range at operating height, no allowances	statute miles	4,880	6,450	6,910	6,210
15. Estimated take-off distance to 50 feet on full power at max. take-off weight	feet	4,100	4,100	4,100	4,100

Some Economic Factors in Civil Aviation . . . . .

a result of intermediate landings. Flight refuelling had obvious advantages at a non-traffic stop.

How some possible journey times fitted into the North Atlantic pattern was shown in a pictorial graph—for which Mr. Masefield acknowledged Mr. C. Dykes, of B.O.A.C. At a true air speed of 400 m.p.h., for instance, the London-New York journey could be accomplished non-stop in about 12 hours' elapsed time. As a result of the five hours difference in time between the two cities, an aircraft could leave London at 10 a.m. after breakfast and arrive in New York at 4.30 p.m. in time for tea—or a "coke." The "apparent" time for the journey would thus be seven hours. In the reverse direction, with the benefit of the winds, a 400 m.p.h. aircraft would take about nine hours for the journey. An overnight service, leaving New York at 7 p.m. before dinner and arriving in London for breakfast at 9 a.m., would thus be possible—an "apparent" journey time of 14 hours. These were about the figures which would be accomplished by the Orion III and IV operated on the basis of improved methods of air traffic control. The forthcoming North Atlantic battle between the turboprop and the plain jet was likely to be maintained for a number of years—although other types of power plant looked like being eliminated.

Mr. Masefield's belief was that the turboprop would have a long and profitable innings, in various forms and developments on long-range services, before it was finally superseded by the plain jet whose extra speed, when allied with range, would make possible a greatly increased earning capacity and, hence, substantially reduced fares.

Until such time as air traffic control was materially improved, the plain jet aircraft would be able to perform very fast services over stage lengths for which smaller conventional types of aircraft could carry similar payloads more slowly. Because of its higher speed the jet would be able to provide a much increased revenue-earning capacity. In consequence, the bigger plain-jet aircraft competing with the smaller and less expensive orthodox aircraft would be able to operate as economically and provide a more attractive service.

For these reasons, experience with commercial jet transports on short and moderate stage lengths was well worth gaining as soon as possible. Every hour of commercial service flown on specialized routes would bring nearer the time when jet types would sweep the board for all stages from 200 miles upwards. Only experience of commercial operations would provide the data on which developments could be planned. In the present state of the art there seemed little object in designing a jet aircraft of less than about 75,000 lb gross weight—a minimum size for economic services over moderate ranges in competition with smaller conventional types.

In his conclusions concerning power plants Mr. Masefield said the orthodox piston engine possessed merits of reliability and of thoroughly understood performance. It was at its best in aircraft of moderate size, flying at moderate speeds and heights, for moderate stages. Compound piston engines using exhaust-driven turbines geared to the crankshaft showed prospects of marked economic advances over the standard engine for long ranges. Turboprops had many problems of their own not encountered in the plain turbojet. Nevertheless, they offered prospects of increased speed over all forms of piston engines without corresponding prospects of increased cost.

One further stage towards eliminating the airscrew, the ducted fan or by-pass engine, offered interesting possibilities. The plain turbojet—whether it be axial-flow or centrifugal—offered the most attractive prospects of all, combined with the largest number of technical and operational headaches, when applied to air transport. At present the economic curve of the jet aircraft resembled a V rather than a U. However, as things were going at present, there were prospects of economical services with commercial jet aircraft for medium ranges during the next six years.

Mr. Masefield concluded on a note of confidence in which he again emphasized that efficient aircraft, matched to the routes that they were to operate, were, and would remain, the fundamental factor in the whole air transport business. Efficient aircraft, attractive to passengers, competitive in performance, reliable in operation and economic in service, could be evolved only through a full understanding of the problems involved. He was confident that civil aviation had a major contribution to make in world affairs, and also in the ability of the aircraft industries of the world in general and the British aircraft industry in particular, to deliver the types of aircraft which would set new standards in performance and economy, and confidence in the air carriers of the world—especially in the air carriers of the United Kingdom and the Commonwealth—to develop that network of economic services which could provide the finest foundation of a new peace and a new prosperity.

Operational Summary	Units	Orion I	Orion II	Orion III*	Orion IV (Easier Standards)
Fuel allowances (taxi, climb and descent)	(lb)	11,580	12,518	12,943	18,264
Fuel Reserves (diversion and stand off)	(lb)	14,320	12,050	17,250	19,740
Max still-air stage length	(miles)	3,435	4,730	4,490	3,475
Block speed	(m.p.h.)	287	289	349	481
Stage length v. 90 m.p.h. wind component	(miles)	2,451	3,356	3,440	2,918
Block speed	(m.p.h.)	205	205	267	404

* By descending on only two engines and standing-off with one inboard engine stopped and its airscrew feathered, the reserves of the Orion III are reduced from the four engine figure of 30,500lb to 17,250lb—a saving of 13,250lb, which is available for either payload or range.

Cost Summary	Orion I (standard piston)	Orion II (compound piston)	Orion III (turbo-prop)	Orion IV (turbo-jet)
Fixed annual costs ...	£332,421	£354,645	£391,245	£351,595
Hourly cruising costs	£146.975	£141.420	£173.425	£151.958
Take-off and landing costs...	£387.78	£417.05	£394.65	£408.36

For an annual utilization of 3,000 hours with seven hours between landings, the operating costs will be :

	Orion I	Orion II	Orion III	Orion IV
Per annum	£938,421	£957,645	£1,080,245	£1,017,198
Per hour	£312	£319	£360	£339
Per still-air stage mile	£1.14	£1.17	£1.07	£0.72
Block speed (still-air) (m.p.h.)	273	272	335	479

	Orion I	Orion II	Orion III	Orion IV
				(on easier standards)
Total annual operating cost	£1,004,500	£1,005,000	£1,160,300	£1,267,700
Annual revenue ...	£796,500	£1,004,000	£1,232,000	£1,548,000
Annual profit per aircraft	Nil	Nil	£71,700	£280,300
Annual loss per aircraft	£206,000	£1,000	None	None

"FLIGHT" BY AIR

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INTERPLANETARY MAN

LECTURING before the British Interplanetary Society at St. Martin's School, London, on Saturday, October 9th, Dr. Olaf Stapledon, the author of *Star Maker* and *Last and First Men*, gave his audience a stimulating hour of philosophical hypotheses on interplanetary man. This subject and its treatment was something of a change from the normal lectures and discussions at the B.I.S. which usually tend to devolve on technical aspects of astronautic study.

Although exhibiting a mental perception utterly untrammelled by conventional limits of imagination, Dr. Stapledon kept in the main to an avenue which, although hypothetical in direction, was, nevertheless, built on a hard core of physical probabilities. Although some of his conclusions were unmistakably, even flagrantly, designed to amuse his audience, he did, nevertheless, warm his hearers at the true flame of philosophy in emphasizing the point that, not only must we unify our own species before setting out on interplanetary exploration, but, equally as important, the fundamentally truthful reasons for making such explorations must previously be recognized.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SMALL AIRCRAFT AT LARGE AIRPORTS

Why Not Patronize Private Airfields?

I WAS amused to read in *Flight* of October 7th "Private Owner's" (D. K. Evans of Birmingham) letter about his Bumbledom experiences when he landed at Northolt.

Why does he not support the private commercial airfields in the London area, Broxbourne (east), Elstree (north), Denham (west), and Redhill (south) of London?

At Denham we rarely charge a landing fee, and enquiries are "discreet."

To take a private aircraft to Northolt or Heathrow seems to be on a par with taking a sailing dinghy to tie up at the Southampton or Liverpool landing stage.

We are looking for a "gentleman," modern variety, who has twice asked us to order a taxi at a certain time, and then neither arrived nor phoned, and left us to pay the taxi.

Denham Aerodrome. J. MYLES BICKERTON, F.R.C.S.

THE VAMPIRE FIGHTER

An Unfair Comparison

THE statement which appeared in your editorial of October 14th to the effect that the Vampire is much slower than the best fighters now flying and is retiring towards the operational trainer category is untrue and gives a distorted impression of the real situation.

A fighter which is in full squadron service, ready for war to-day, ought not to be compared with later prototypes which still require considerable development and tooling before they can be put into full production for home and overseas use.

If we compare the Vampire with other fighters which are contemporarily in service in Britain, America and elsewhere, there can be little doubt that the Vampire is unequalled in fighting effectiveness. And by reason of its exceptionally docile qualities it is particularly suited for an urgent rearmament programme.

If a comparison is being made on the basis of the next generation of fighters, then it is not the present-day Vampire which should be compared. JOHN CUNNINGHAM.

Hatfield, Herts.

[*Past history has shown that the first-line aircraft type of to-day becomes the trainer of to-morrow. It was that which we had in mind when we stated that the Vampire is retiring towards the operational trainer category. We certainly did not intend to imply that such retirement is imminent. Our point was that by the time an enemy could capture and examine a Vampire, the information would come too late to be of much value to him.*—ED.]

AUTOMATIC LANDINGS

Pilots Should Not Object

AS a member of the profession which is most directly concerned with the problems of automatic landings, I should like to place on record at least one airline pilot's approval of this scheme. One is continually hearing of a latent objection on the part of pilots to the idea of entrusting themselves and their aircraft to a mechanical landing device, but I doubt now whether this objection is sustained by the majority, and even if it is, in some cases I suggest it is no longer valid.

No one can deny the success of the ground-controlled approach system, and there must be few pilots who can produce a real objection to changing the sound of "turn left 5 degrees" in their headphones to a series of "Ns" or some other radio signal to indicate an off-track position to the right.

More reasonably, the merit is, I am sure, fully recognized of a system which enables the pilot to concentrate entirely on the handling of his aircraft under instrument conditions, without having to concern himself with his orientation.

From this point it is a logical step to the automatic control of an aircraft from the orbiting position to the touch-down point. By this it is in no way suggested that the pilot should abandon his aircraft to the mercies of a robot, whilst sipping tea in the steward's galley, but rather that he should be relieved of the physical and mental strain involved in flying a large aircraft along a radio beam, in order that he may monitor a mechanical device which is guiding the aircraft down to a safe landing.

At all times his instruments, plus the signals being received by his radio equipment, should present a continuous picture of the aircraft's progress, and in the event of some deviation from the correct azimuth or approach path, due to some failure on the part of the equipment, he would still be at liberty to break off his approach, as would be his practice with present-day equipment.

The final touch-down in zero-zero conditions would certainly prove somewhat of a strain in the early days, but here again the pilot retains the use of his altimeter, A.S.I. and rate-of-descent meter, to warn him of the impending contact with the runway; and if the indications presented by these instruments were not conducive to a safe landing, he would still be able to take corrective action.

It is common flying-boat technique to ignore a sight of the water on glassy surface or night landing, but rather to rely on instruments to obtain a safe, flat approach path down to the water. So, provided runways are of reasonable dimensions, any landplane pilot's objections to such a landing would soon be overcome as he gained confidence in the equipment.

For my part, I say, "Bring on the automatic landing aid." Any device which alleviates the pilot's burden, which, as we scale the pinnacles of aviation progress becomes progressively heavier, will, I am sure, in time be fully approved by all.

Effingham Common, Surrey. DAVID BRICE.

FRUSTRATING THE TOWER OF BABEL

Bring Foreign and British Air Writers Together

A GREAT many foreign journalists come to the S.B.A.C. Show annually, but nothing is ever done to bring them together or get them to meet our own air writers. It does not seem to have occurred to the officers of the S.B.A.C., the Director of which was himself a journalist once. I suggest that in future years a dinner or cocktail party be arranged by the S.B.A.C. at some such place as the Aviation Centre, and that all British air writers of standing be invited to meet their foreign and overseas colleagues. Much good might befall British aviation in general from such a meeting. Or perhaps, if the S.B.A.C. think it is not their job, such a party could be arranged by the Circle of Aviation Writers. I know nothing of the constitution or aims of this young body, which came into existence after I had left aviation writing for a short while, and I have seen nothing of it since my return.

London, S.W.3 GEOFFREY DORMAN.

FORTHCOMING EVENTS

Oct. 21st.—Royal Aeronautical Society: "Cold Weather Operation of Aircraft," G. W. Wilson, A.F.R.Ae.S. and S/L E.P. Bridgland R.C.A.F., B.Sc., A.F.R.Ae.S.

Oct. 22nd.—Bristol and Wessex Aeroplane Club: Aviation Ball, Grand Spa Hotel, Bristol.

Oct. 23rd.—Helicopter Association of Gt. Britain: "Automatic Stabilization of Helicopters," Dr. G. J. Sissingh, Dr. Ing.

Oct. 26th.—R.Ae.S. (Graduates and Students): "Flight Refuelling," Sir Alan J. Cobham, K.B.E., Hon. F.R.Ae.S.

Oct. 27th.—R.Ae.S. (Preston): "Design Problems of Large Flying Boats," H. Knowler, F.R.Ae.S.

Oct. 30th.—S.L.A.E. (South Eastern Area): "High Speed Flight," by W. A. Waterton, Manson House, 26, Portland Place, London, W.1. at 3 p.m.

Nov. 1st.—R.Ae.S. (Derby): "Fighter Aircraft of the World," Sqn. Ldr. H. F. King, R.N.E.

Nov. 4th.—Sir John Cass Technical Institute: "The Aero Gas Turbine," W. Tipler M.A.

Nov. 10th.—R.Ae.S. (Graduates and Students): "Flying Experiences," Lt. Cdr. (A) E. M. Brown, O.B.E., D.S.C., A.F.C., M.A., A.R.Ae.S., R.N.

Nov. 12th.—Redditch Society: "Aircraft Photography," John Yoxall.

Nov. 17th.—R.Ae.S. (Hatfield): "Design Problems of Large Flying Boats," H. Knowler, F.R.Ae.S.

Nov. 17th.—R.Ae.S. (Preston): "Investigation of Aircraft Accidents," A. Cdre. Vernon Brown, C.B., O.B.E., F.R.Ae.S.

Nov. 17th.—Royal United Service Institution: "Jet Aircraft and their Possibilities," Dr. S. G. Hooker.

Nov. 19th.—Institute of Navigation: "Magnetic Compass Problems—A Fresh Approach," Dr. G. N. Harvey, O.B.E.

Nov. 20th.—Joint Meeting Royal Aeronautical Society and Helicopter Association of Gt. Britain. Full day Discussion on Helicopters.

Nov. 27th.—S.L.A.E. (South Eastern Area): "Gas Turbine Power Plants," by D. H. Mallinson, B.Sc., Manson House, 26, Portland Place, London, W.1. at 3 p.m.

SERVICE AVIATION

STEPPING OUT : One of the "parasisters" of the recently formed R.A.F. Parachute Medical Teams makes her exit from a Dakota, while a colleague takes up a ready position at the door. A male nursing orderly with kitbag can be seen on the lower right.

R.A.F. Appointments

THE Air Ministry announces that Air Marshal Sir Arthur P. M. Sanders, K.B.E., C.B., is to succeed Air Chief Marshal Sir James Robb as Vice Chief of Air Staff. Air Marshal Sanders took over command of the British Air Forces of Occupation in Germany last December, before which he was Commandant of the R.A.F. Staff College for two years. Air Marshal Sanders, who is 50, received his permanent commission in 1919. He will be succeeded as C.-in-C. B.A.F.O. by A.V-M. T. M. Williams, C.B., O.B.E., M.C., D.F.C., who receives the acting rank of Air Marshal.

Air Marshal Sir Arthur Sanders.

Also announced is the appointment of A.V-M. R. O. Jones, C.B., A.F.C., as Senior Air Staff Officer of R.A.F. Reserve Command. The appointment is a visible indication of Reserve Command's increasing prominence in the pattern of Britain's air defence, as it is the first time that the post of S.A.S.O. has been held in the Command since its formation in 1946. A.V-M. Jones will be responsible to his C.-in-C. for flying training, intelligence, operations planning, and operations of the Command.

A. Cdre. G. E. Nicholetts, A.F.C., who for two years has commanded the R.A.F. Central Photographic Establishment at Benson, has been appointed Director of Organization, Air Ministry. In 1933, as a flight lieutenant, he accompanied the late S/L. O. R. Gayford in the special Fairey long-range aircraft on a flight from Cranwell to Walvis Bay, S.W. Africa, setting up a world record of 5,341 miles.

Royal Air Force and Naval Aviation News and Announcements

Combined Commands

THE operational commands of the British and American air forces supplying Berlin were on October 15th merged into the Combined Air Lift Task Force, commanded by Maj. Gen. W. Tunner, of the U.S.A.F., previously Commander of the American air-lift task force. His deputy is A. Cdre. Merer, of the R.A.F., whose H.Q. are at Buckeburg, while Gen. Tunner remains at Wiesbaden. The two air forces retain separate administrative control over their own airfields.

Hyde Park Fly-past

FIGHTERS of R.N.V.R. and R.Aux.A.F. Squadrons will fly overhead when H.M. the King inspects territorial forces in Hyde Park on Sunday, October 31st. The formations will be led by 16 Seafires of Nos. 1831, 1832 and 1833 R.N.V.R. Air Squadrons, followed by 24 Spitfires representing Nos. 601 (County of London), 604 (County of Middlesex), 600 (City of London), and 615 (County of Surrey) Auxiliary Squadrons. Last in the fly-past will be 12 of the R.Aux.A.F.s recently acquired jet fighters—six Vampires from 605 (County of Warwick) Squadron, and six Meteors from 500 (County of Kent) Squadron. A rehearsal of the fly-past will be held on Sunday, October 24th.

605 Honoured

ON Saturday, October 9th, No. 605 (County of Warwick) Squadron, R.Aux.A.F., received the freedom of Stratford-upon-Avon, an honour conferred at the same time on the Royal Warwickshire Regt. and the Warwickshire Yeomanry. The illuminated deed of privilege which was presented to A. Cdre. J. A. C. Wright, Honorary Air Commodore of the Squadron, allows "the right on all ceremonial occasions of marching through the Borough of Stratford-upon-Avon with drums beating, bands playing, colours flying and bayonets fixed." After A. Cdre. Wright had acknowledged the honour accorded the Squadron there was a fly-past by Vampires of 605 Squadron.

Observers' Exercise

METEORS, Hornets, Mosquitoes and Spitfires, from Fighter Command's No. 12 Group, will take part in a three-hour exercise for 15,000 members of the Royal Observer Corps next Sunday afternoon (Oct. 24th). Although some low flying is essential care will be taken to disturb the public as little as possible in populated areas. The main R.O.C. centres in the operation are at York, Norwich, Cambridge, Bury St. Edmunds and Lincoln.

Air-war Demonstration

THE Commander-in-Chief, Air Forces Western Europe, Air Chief Marshal Sir James Robb, will open this year's Special Senior Course at the School of Land-Air Warfare at Old Sarum, on Salisbury Plain, on Monday, October 25th. The course lasts a week and will be attended by senior officers of the Services and Dominion air force representatives. There will be demonstrations of air offensive and transport support operations by aircraft of the R.A.F.,

supplemented by F-80 Shooting Stars and B-29 Superfortresses of the U.S.A.F. The F-80s are from the U.S. zone of Germany, and will operate from the Fighter Command Meteor base at Tangmere during their stay in England. It is considered probable that the Supermarine Attacker, Hawker P.1040, and D.H.108 will also be displayed in the air.

The first demonstration will take place on Tuesday, October 26th, and will illustrate modern air-to-ground offensive support, employing 500-lb bombs, rocket projectiles, and cannon fire. Airborne operations will take place at Netheravon on the following day, when men and equipment will be dropped by parachute.

New W.A.A.F. Tropical Mess Uniform

A NEW tropical mess dress has been approved for W.A.A.F. officers, consisting of a smart dress in white drill, with short sleeves finished with a turned-back cuff, and a seven-gored skirt. Rank is shown by half-width gold-lace braid on Air Force blue shoulder straps, surmounted by an eagle and crown in gold embroidery.

More Reserve Recruiting

TRAINING for navigators and signallers is now to be given in Ansons at all the R.A.F. Reserve Centres already accepting pilots. The names of aircrew volunteers will also be taken at the Liverpool and Newcastle-on-Tyne Centres, in preparation for the opening of Flying Schools there. Ground crews are also being enrolled now at all Reserve Centres, with the exception of Doncaster, Chessington, Kenley and Hornchurch.

Carriers Off St. Helena

SEA FURIES and Fireflies from the light fleet carriers *Theseus* and *Vengeance* flying over the island of St. Helena in the S. Atlantic provided a rare spectacle for the inhabitants on October 12th, when these units of the Home Fleet passed the island *en route* to South Africa. When the aircraft executed a flypast over Government House at Jamestown, the capital, the excited St. Helena schoolchildren, many of whom had never seen aircraft before, dashed out of school at first sound of the squadrons, states a report from the *Theseus*. While the Commander of the accompanying destroyer *Corunna* was having lunch with the Governor of the Island, a Firefly from the *Theseus* dropped a bag on to the lawn, some 25 yards from the lunch table, containing photographs of Jamestown harbour taken from the air that morning.

"Flight" photograph.

FIREBRAND'S FILLIP: A standard Blackburn Firebrand 5 of No. 813 Naval Air Squadron, equipped with assisted take-off rocket tubes.

R.U.S.I. Lecture

BRIG.-GEN. A. E. RICHMOND, C.B.E., K.H.S., will deliver a lecture next Wednesday, at 3 p.m., to members of the Royal United Services Institute on "The physiological problems set by modern warfare in regard to the fighting man." The lecture is to be given at the Institute's premises in Whitehall, and entry is restricted to members and their friends. The chair will be taken by Air Marshal P. C. Livingston, C.B., C.B.E., A.F.C., F.R.C.S., K.H.S., who is director of the R.A.F. medical services.

Memorial Awards

IN 1946 Major and Mrs. Keith Groves placed a sum of money at the disposal of the Air Ministry to enable three awards to be made annually, in memory of their son, Sgt. L. G. Groves, a meteorological observer killed on a weather flight in September, 1945. The awards made this year have now been announced, and are as follows: the L. G. Groves Memorial Prize for Aircraft Safety has been awarded to W/C. T. Q. Horner, for improvements in R.A.F. rescue facilities. Dr. R. Frith, of the R.A.F., receives the Memorial Prize for Meteorology in recognition of valuable work with the Met. Research Flight, and the L. G. Groves award for meteorological observers goes to F/S. P. G. White, R.A.F.V.R.

Aircrew Exchange

PLANS for an interchange of aircraft and crews, to take part in training and manœuvres, between the R.A.F. and French Air Force were discussed by the Secretaries for Air of the two countries, M. Jean Moreau and Mr. Arthur Henderson, and the Chief of Air Staff, Lord Tedder, at a conference in London earlier this month. Under the co-ordinating scheme of Western Union defence, methods of combat and training of the component air forces will be standardized.

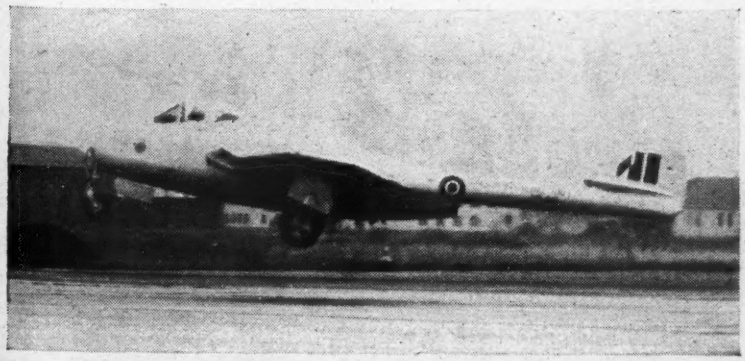
Canadian Air Training Again?

ALTHOUGH there is no news of official consideration of the subject, there are speculations in Canada regarding possible revival of the wartime joint R.A.F.-R.C.A.F. Air Training Plan, in view of the increased aircrew commitments lately taken on by the R.A.F. The R.C.A.F. has also stepped up its training programme.

Beating the Birds

LAST year 13 accidents to aircraft in this country, and 17 in other parts of the world, were caused by birds. Experiments in one method of decreasing this danger were conducted at R.A.F. Station Shawbury about a year ago, when it was shown that a few "sorties" each day by a peregrine falcon would keep plovers away from the airfield.

The scope of the experiments is to be increased this year; 15 peregrine falcons have now been supplied to the R.A.F., and they will operate from Driffield and Coltishall. Two groups of trained R.A.F. falconers, consisting of two flight sergeants, a corporal, and three aircraftmen, will superintend the flying, while their civilian trainer in falconry, Mr. Ronald Stevens, will test independently the deterrent effect of falcons against the seabirds which frequent coastal airfields. It is emphasized that the purpose of the experiments is to discourage birds



DEFT NOVICE: Lt. A. B. Clark lands at Idlewild in the Sea Vampire 20 after an aerobatic performance which gave no hint that his previous flying time on the Vampire was only 80 minutes.

Service Aviation . . . . .

from flocking near airfields, and not to destroy them.

Northern Ireland Air A.D.C.

THE Senior Air Staff officer at R.A.F.H.Q., N. Ireland, W/C. A. M. Montagu-Smith, has been appointed an Honorary Air Aide-de-Camp by the Governor of Northern Ireland. Before his posting to Northern Ireland in October, 1947, W/C. Montagu-Smith commanded in succession No. 540 Squadron (Mosquitos) and No. 42 Squadron (Beaufighters).

R.C.A.F.A.

AIR CHIEF MARSHAL L. S. BREADNER, C.B., D.S.O., R.C.A.F., was on September 16th elected Dominion President of the newly formed Royal Canadian Air Force Association at an inaugural meeting in Ottawa, when provisional election of 17 officers from different parts of Canada took place. The President told delegates that the general aim of the association was to provide a means for former members of the R.C.A.F. to unite, to support their Air Force and serve their country.

N.Z. Air Reserves

TRAINING for the New Zealand Territorial Air Force, which is to have five squadrons and 2,000 men, with an Active Reserve of 2,000 will begin towards the end of this year. At Auckland, Wellington, and Christchurch a squadron of two fighter flights and one bomber flight will be established, and at Dunedin there will be three fighter flights. An additional squadron of fighter aircraft will be established in the north.

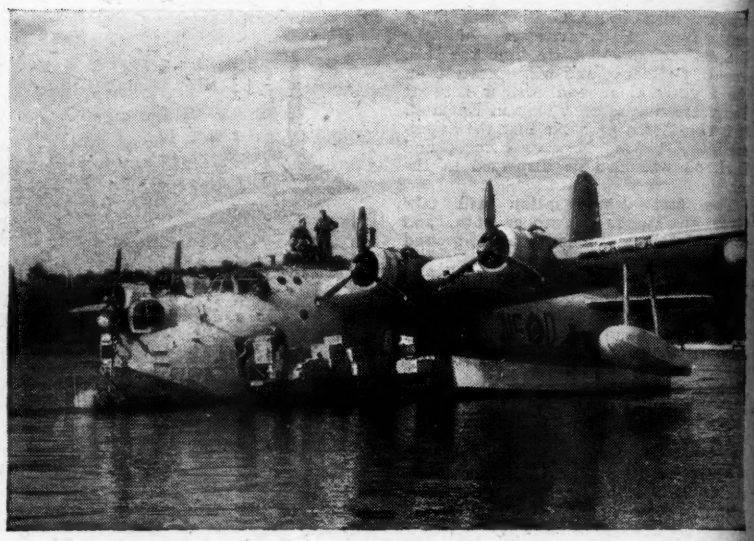
An initial nucleus will be drawn from war-experienced aircrew, though the scheme provides for younger men to be trained later.

R.A.F. Trains T.A. Paratroops

PARACHUTE training centres are being formed near Territorial Army H.Q.s in London, Liverpool, Leeds, Glasgow, Cardiff, Newcastle, Southampton, Birmingham and Bristol. The R.A.F. will provide instructors, equipment and facilities for synthetic training, and maintenance for balloons and parachutes. Instructors will come from the R.A.F. parachute training centre at Upper Heyford, where parachutes will be re-packed after use. Territorials of the 16th Airborne Division (T.A.) will jump from moored balloons in dropping zones over a wide area; 25 such jumping classes have already been held at 15 different "D.Z.s" during recent months, and about ten more will take place in the near future.

R.A.F. Gardening Show

THE sixth, and so far largest, annual R.A.F. fruit and vegetable show was held at the Horticultural Hall in Westminster on Sept. 28th. R.A.F. Halton's display of 12 kinds of vegetables won the Royal Horticultural Society's cup for the best exhibit, and R.A.F. Lindholme faced keen competition from 215 other stations in winning the R.A.F. Unit Gardens Trophy, for most successful food production. Lindholme has in two years built up a 70-acre farm which supplies all the vegetables, all the bacon, and much of the meat consumed on the station.



CARGO BOAT: Supplies for Berlin are transferred from one of the air-lift Sunderland 5s to barges on Havel Lake. A plan to operate U.S. Navy Mars flying boats from the lake has been shelved.

Award for Safety

AN Accident Prevention Trophy is to be awarded annually to the flying station in Transport Command with the lowest accident rate. The A.O.C.-in-C. Transport Command, Air Marshal Sir Brian Baker, will present the trophy early next year, on the results of this year's operations. The award takes the form of a silver model of the Halifax 3 bomber, originally presented to H.Q. No. 4 Group, Bomber Command, by Handley Page, Ltd. The Group later transferred to Transport Command and eventually disbanded.

The R.A.F. Chapel

ALL ranks of the R.A.F. are reminded that when in uniform they may visit the Royal Air Force Chapel in Westminster Abbey, with its Battle of Britain window, free of charge. A book about the history of the Chapel, with 16 full-page illustrations and a coloured plate of the window, is now on sale, price 2s 6d, at the Abbey, or by post from Skinner & Co., 124, Denmark Hill, S.E.5.

Permanent Commissions

GENERAL DUTIES BRANCH

Wing Commanders: G. L. C. Bagshaw, P. J. Halford, A.F.C., R. E. Jay, N. McClelland, O.B.E., P. R. Patrick, G. A. C. Potts, D.F.C.

Squadron Leaders: C. F. Ambrose, D.F.C., G. Buckle, V. G. Daw, D.F.C., A.F.C., T. W. C. Fazan, R. R. Fuller, A.F.C., E. J. Greenleaf, D.S.O., D.F.C., E. D. Griffiths, D.F.C., H. W. Harrison, L. F. Kelly, R. J. A. Leslie, D.S.O., A.F.C., R. B. Lord, A.F.C., D. J. Penman, D.S.O., D.F.C., F. E. F. Prince, C. S. P. Russell, D.F.C., A. G. Salter, D.F.C., A. J. Scott, D.F.M., H. A. T. Skehill, W. M. Thallon, F. E. Webb.

Flight Lieutenants: D. F. Adcock, H. D. Archer, R. H. Arscott, K. M. Ashley, C. D. Bartman, J. F. Bazalgette, L. G. Berry, D.F.C., W. W. Bibby, I. P. Bishop, D.F.C., R. T. Bowring, A.F.C., H. G. Bullen, R. H. Burgess, A. H. Chamberlain, H. Charnley, K. H. H. Cook, D.F.C., V. R. Cooney, M. Crosbie, D. H. T. Dimock, F. E. Dymond, R. L. Easterbrook, R. Emett, K. Etchells, D. L. A. Finlay, R. P. Flood, G. Gray, E. D. Green, W. J. C. Green, D.F.C., W. K. Greer, A.F.C., J. P. Hammond, D. W. Harvey, F. V. Houlgate, H. W. Howe, D.F.C., J. L. W. Innes, D.F.C., A. R. G. Jackson, A.F.C., H. L. Jones, P. V. Lockett, I. MacDonald, D.F.C., M. Mays, L. T. Mersham, J. T. Newboult, W. E. Pettifer, H. I. Popay, D.F.M., D. S. V. Rake, B. H. Reece, B. M. Ridgway, D.S.O., D.F.C., W. R. Ringrose, D.F.C., R. B. Roache, D.F.C., E. J. Roberts, I. H. Schofield, R. B. Sillars, W. C. Sinclair, A.F.C., A. R. S. Smith, D.F.C., C. C. W. Smith, F. W. Sorenson, R. F. Starnes, D.F.C., J. E. Taylor, D.F.C., D.F.M., F. J. Vickers, R. B. Warr, R. C. Williams, D.F.C.

Flying Officers: P. P. Baker, D. R. Barnicoat, R. C. Bridges, D. Chapman, R. H. Clymo, B. L. Collings, V. H. Cramer, P. J. Dight, D. A. Dunlop, D. L. Eley, E. Fielding, R. F. Fisher, J. G. Greenhill, D. J. Hampton, W. I. Hart, D. G. L. Heywood, B. M. Hodgson, H. J. E. Howe, P. H. Hudgell, L. Hully, W. C. Kendall, B. J. Leonard, R. S. Lloyd, M. D. Marshall, H. Minnis, P. G. Middleton, J. M. Nicholls, D. O. Parry-Davies, J. J. Phipps, E. E. Reynolds, T. A. Ridout, E. J. Shaw, C. H. Sloan, E. J. Strangeway, M. J. E. Swiney, E. Walker, B. W. Wellicombe, R. J. Wilson, M. J. Woodyer, D. R. Young.

R.A.F. REGIMENT

Flight Lieutenants: W. McDean, T. D. Williams.

Flying Officers: A. A. J. Hudson, K. F. Plowman, D. B. Stebbing.

Pilot Officer: L. U. Matthews.

AIRCRAFT CONTROL BRANCH

Squadron Leaders: D. Forward, S. H. Pain, P. H. Tew.

Flight Lieutenants: P. Jermyn, J. A. Kennedy, D.F.M., A. Mitchelmore, H. Vertican, D.F.C., C.G.M.

Flying Officer: C. O. Beck.

MARINE CRAFT BRANCH

Flight Lieutenant: B. Scott.

PROVOST BRANCH

Squadron Leader: R. H. Fox.

Flight Lieutenants: R. D. Cooper, C. P. Foster, H. E. Meade.

Flying Officer: F. P. S. Stacey.

CATERING BRANCH

Flight Lieutenant: W. A. Kerr.

Flying Officers: J. G. Chew, F. S. Thompson.

PHYSICAL FITNESS BRANCH

Squadron Leaders: F. McP. Coles, D. L. Williams.

Flight Lieutenants: N. J. Brown, D. E. Oxborrow, C. Williams.

Reunion

NO. 825 Royal Naval Air Squadron will hold its annual reunion at the "Chandos," St. Martin's Lane, London, W.C.2, on Saturday, October 23rd, at 7 p.m. All correspondence to Hon. Sec., Reunion Committee, at 11, Cornwall Mews South, London, S.W.7.